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THE SURGICAL ASPECTS OF FIBRINOLYSIS

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AS EARLY AS THE EIGHTEENTH CENTURY, Morgagni (1769) (106) and Hunter (1794) (68) published observations on the incoagulate nature of the blood in cases of sudden death. A considerable literature has since appeared in the hematological field, but it is only in recent decades that surgeons have become actively interested in the vagaries of serum proteolysis. In our present state of surgical competence, one is rarely concerned with hemostasis purely from the standpoint of surgical technique. Not uncommonly during routine surgical procedures the operator may be confronted with an obvious coagulation defect that can assume catastrophic proportions. In such an instance, the usual emergency hemostatic measures available to the surgeon at the operating table become patently inadequate and, without an understanding of the pathological entity in progress, the surgeon may encounter significant morbidity and mortality. The purpose of this article is to review factors pertinent to development of serum proteolysis in surgery and to suggest specific therapeutic measures for control of this phenomenon.

HISTORICAL ASPECTS

Following the early observations of Morgagni (1769) (106) and Hunter (1794) (68) on the fluidity of the blood in cases of sudden death, a series of studies were independently made by Denis (1838) (44), Zimmerman (1848) (157), and Green (1887) (58). It was noted that ox fibrin suspended in saline solution would remain unchanged for many days, while human fibrin secured by cupping would lyse within 12 to 24 hours. Green (1887) (58) made the significant observation that once lysis of fibrin had occurred, the addition of thrombin would not induce fibrin to reconstitute itself, which indicated that the process was irreversible. Dastre (1893) (41) studied the dissolution of fibrin in dogs subjected to hemorrhagic shock and concluded from his observations that active digestion of fibrin was a reality. He first coined the term "fibrinolysis." Nolf (1905) (111) induced proteolytic activity in hepatectomized dogs by means of peptone and postulated the presence of a proteolytic enzyme of humoral origin.

In 1906, Morowitz (107) first demonstrated reduction in plasma fibrinogen in cases of sudden death and noted active serum fibrinolytic activity in the patients. He showed that the blood of such individuals, when added to normal serum, would actively depolymerize fibrinogen and fibrin. Fidon, Gautier, and Martin (1908) (51) confirmed these observations in asphyxiated dogs. Hedin (1903) (66), and Opie and Barker (1907) (112) made significant progress in this

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field by protein fractionation methods. They separated the albumin and globulin fractions by means of salt precipitation techniques and found active fibrinolytic activity in the globulin fraction. The albumin fraction appeared antifibrinolytic in nature. Feissly (1942) (50), and Macfarlane and Pilling (1946) (95) have made similar confirmatory studies of this type.

Dale and Walpole (1916) (40), in reviewing the observations of Denys and Marbaix (1889) (45), and Delezenne and Pozerski (1903) (42) suggested that the addition of chloroform destroys the inhibitory or antiproteolytic properties of serum, allowing the proteolytic elements uninhibited activity. The latter workers had reported the development of serum proteolysis after the addition of chloroform, ether, or thymol. It then became evident that fibrinolytic activity could be induced in vitro by chemical agents and that the addition of normal serum inhibited the phenomenon.

In 1933, Tillet and Garner (141) found that rapid fibrinolysis would occur in plasma clots incubated with beta hemolytic streptococci or their extracts. Milstone (1941) (104) observed that in this instance lysis would occur only in the presence of small amounts of the globulin fraction of human blood protein. Kaplan (1944) (75), Christensen (1945) (31), and Christensen and MacLeod (1945) (34) conclusively demonstrated that the lytic factor of Milstone was a precursor or proenzyme of a proteolytic agent activated by the bacterial filtrate. The activator was termed "streptokinase," the precursor, "plasminogen," and the proteolytic enzyme, "plasmin." The inhibitor present in the albumin fraction was called "antiplasmin." Lewis and Ferguson (1951) (87) have subsequently shown that bacterial filtrates of staphylococcus origin also have similar activating properties.

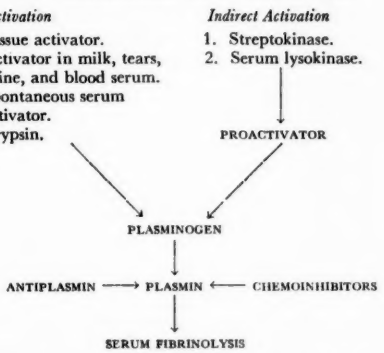
Hedin (1903) (66), Abderhalden and Abderhalden (1921) (1), and Rosenmann (1936) (116) reported the presence of fibrinolytic and proteolytic enzymes in mammalian tissue. Demuth and Riesen (1928) (43) were the first to suggest the activation of a humoral proenzyme by tissue activators. In 1947, Astrup and Permin (16) introduced the fibrin plate technique for the detection of fibrinolytic activity and noted the presence of an activator in tissue that converted plasminogen to plasmin. Astrup, in 1948, 1951, 1951, (7, 8, 9), and Astrup, Crockston, and MacIntyre, in 1950, (13) studied the tissue activator in various mammalian species and found the highest titers in the pig heart, human lung, and human brain. Goldhaber, Cornman, and Ormsbee (1947) (55), working in the tissue culture field, made the discovery, simultaneously with Astrup and Permin (1947) (16), of the ability of various tissues to activate proteolytic activity in plasma clots. They postulated a similar activating agent of tissue origin capable of converting plasminogen to plasmin. The activator mechanism was further elucidated by the work of Geiger (1952) (54) and Mullertz and Lassen (1953) (109, 110) who demonstrated direct and indirect types of activation, the indirect form being dependent on a proactivator found in the euglobulin fraction of mammalian serum protein. The serum proactivator varies in titer in mammals, being relatively high in human serum, for example, and absent in bovine serum. Ablondi and Hagan (1957) (2) have recently compared the solubility, stability, purification, and spontaneous activation characteristics of serum proactivator and plasminogen. Utilizing efficient synthetic substrate assay methods they conclude that proactivator and plasminogen may actually be identical in nature. If the data of Ablondi and Hagan can be confirmed by other workers in the field, the concept of a serum proactivator may have to be abandoned, leaving the simpler and less complex conception of direct plasminogen activation by a variety of biochemical activators.

GENERAL THEORY OF MECHANISM OF PLASMINEMIA

It is probable that serum proteolytic activity is essentially a homeostatic mechanism concerned with the lysis of superfluous fibrin and other humoral debris of protein origin. In the steady state there is a delicate and precise balance between proteolytic and antiproteolytic factors in the serum. Under normal conditions, the blood manifests no fibrinolytic activity. In the presence of sudden death, trauma, major surgery, hematogenic shock, transfusion reactions, chronic anxiety, great exertion, and the administration of adrenalin considerable serum proteolytic activity may become clinically apparent. Ungar and Damgaard (148) have shown that there may be a direct relation of circulating antiplasmin to pituitary-adrenal activity. They noted that the administration of ACTH or cortisone stimulated antiplasmin production in the guinea pig. The phenomenon is dependent upon

the spleen, for after splenectomy no stimulation of antiplasmin titer is apparent. They found that a simple splenic extract, "splenin A," would restore antiplasmin activity in the splenectomized animal maintained on ACTH and cortisone. A second splenic extract, "splenin B," appeared to inhibit antiplasmin production, like thyroid-stimulating hormone, growth hormone, thyroxin, and desoxycorticosterone acetate.

SCHEMA OF MECHANISM OF FIBRINOLYSIS



Disruption of the delicate proteolytic-antiproteolytic balance can be induced only by activation of the proenzyme plasminogen. The mechanism of activation in mammals is complex and far from being clearly elucidated. Fundamentally, serum proteolytic activity results from an interaction between plasminogen, an enzyme precursor in the blood, and a system of activators of diverse origin. A proteolytic enzyme, plasmin, that is capable of hydrolysing fibrin, fibrinogen, prothrombin, antiplasmin, and other serum proteins is consequently liberated. It is probable that the degree of activation obtained depends on the relative concentrations of activator, plasminogen, and inhibitor which are present at the site of activation.

Astrup (11) has described three types of proteolytic activity: spontaneous, local, and general. Spontaneous fibrinolytic activity is commonly seen in solutions of plasminogen exposed to room temperature. Mullertz and Lassen (110) found a strong plasminogen activator under these conditions with very little plasmin. The serum activator is formed, it is believed, by the transformation of an inactive, euglobulin precursor found in high concentration in human blood, but in low concentration in animals. The serum activator formed is extremely labile and similar to the urinary activator described by Astrup and Sterndorff (21).

Soicher, Richards, and Bram (127) determined the normal range of human plasminogen at 400 to 900 arbitrary Loomis units. The specific chemical nature of plasminogen is unknown. The exact mode of enzymatic transformation to active plasmin is equally puzzling. Whether it is actually chemically converted to plasmin or simply absorbed on the plasmin molecule is problematical. However, it is evident experimentally that an active lytic agent is produced with subsequent digestion of specific serum proteins, fibrinogen, fibrin, antiplasmin, and probably platelets. Selective synthetic organic substrates are also hydrolysed by plasmin and provide the investigator with an excellent means of quantitative assay.

The local and general fibrinolytic mechanisms operate independently, but direct transition can be made from the local process into the general reaction. The local process involves the interaction of tissue activator, liberated by the injury or death of cells, and plasminogen. It is a direct reaction with the production of restricted fibrinolysis and concerned solely with the repair of damaged tissue and the dissolution of unnecessary fibrin.

The general reaction is systemic in nature and may represent an extension of the local process due to exuberant activation or impotent inhibition by antiplasmin. The general process, unlike the local, Astrup (11) believes, is indirect in nature as it involves the activation of a euglobulin proactivator. The resulting blood activator then directly transforms plasminogen into a humoral proteolytic agent, plasmin. The reaction may become generalized and, if potent enough, can become clinically apparent with a significant coagulation defect due to the reduction in circulating elements required for the coagulation process.

The role of antiplasmin in the inhibition of fibrinolytic activity in vivo is little understood. It is apparent from the clinical studies in surgical patients by Cliffton (36) that serum antiplasmin fluctuates during the course of most operative procedures. He has shown that with the onset of plasminemia there is a corresponding decrease in serum antiplasmin. There appears to be a reciprocal relationship between plasmin and antiplasmin during surgery. At the height of the plasminemia, antiplasmin values are rela-

tively low, while from 1 to 3 days postoperative, following the subsidence of lytic activity, the antiplasmin titers gradually increase in magnitude. Subsequent authors have attempted to correlate serum antiplasmin values with serum trypsin inhibition activity. Meyers, Burdon, and Riley (101) found no marked fluctuation in serum trypsin inhibition in surgical patients. The arithmetical means for all cases were never lower than 90.7 per cent of the maximum value. Jacobsson (72) noted in extensive electrophoretic studies that the trypsin inhibitory action of human serum permits no conclusions as to the plasmin inhibiting activity of the serum. Methods for the quantitation of serum antiplasmin at present are inadequate, so that a natural skepticism must be preserved in the evaluation of papers concerned with the subject.

PROPERTIES OF PROTEOLYTIC AND ANTIPROTEOLYTIC AGENTS

Plasmin

Plasmin is a proteolytic agent of humoral origin dependent upon the activation of plasminogen and inhibited by antiplasmin and heparin. It is a proteinase, capable of digesting under suitable conditions, fibrinogen, fibrin, plasma proteins, prothrombin, casein, and gelatin. It has a pH range of 7.2 to 7.7 and is heat labile, being denatured at temperatures of 50 to 60 degrees centigrade in 30 minutes. In contrast to trypsin, its rate of proteolysis is very rapid. It is a nondiffusible protein of globulin origin and can be precipitated by the common protein-precipitating agents, such as half saturated ammonium sulfate, saturated sodium sulfate, acetone, alcohol, and trichloracetic acid. It is specifically inhibited by antiplasmin and soybean trypsin inhibitor. It is also inhibited by sodium thioglycolate, guanidine hydrochloride, urea, and heat.

The plasmin unit has varied in the literature with various authors. Guest, Daly, Ware, and Seegers (62) have defined the plasmin unit as that amount of plasmin that will liquefy 1 cubic centimeter of 0.1 per cent fibrin clot in 120 seconds at 28 degrees centigrade buffered in imidazole at pH 7.6. Loomis (89, 90) described it under different experimental conditions as that amount of plasmin that will dissolve 1 cubic centimeter of 0.3 per cent fibrin clot in 120 seconds at pH 7.2 at 45 degrees centigrade in isotonic saline solution buffered with imidazole. The plasmin units are absolutely arbitrary and are actually dependent on the quantitative method employed in the determination of plasmin.

The measurement of serum fibrinolytic activity, despite the voluminous literature to the contrary, is difficult. Qualitative procedures are legion, and accurate quantitative determinations are not possible in the light of current understanding of the problem. The chief obstacle lies in the obvious difficulties associated with the measurement of fluctuating proteolytic activity in the presence of antiproteolytic agents, proactivators, and activators. Until a reliable method is found to isolate and thereby quantitate accurately the inhibitors from the active lytic agents, experimental results will remain chiefly quasi-quantitative in nature. The usual methods currently in use for the determination of proteolytic activity include: simple observation of the bleeding and clotting times (155); measurement of fibrinolytic activity by simple lysis of the standard fibrin clot (62); the fibrin plate method of Astrup and Mullertz (15); the casein hydrolysis methods of Kunitz (81) and of Christensen (32, 33); the thromboelastographic technique of Von Kaulla (151, 152); the spectrophotometric determination of fibrinolysin and antifibribrinolysin by Ungar, Damgaard, and Hummel (149), and a very sensitive measurement of fibrinolytic activity utilizing radioactive iodinated fibrinogen by Shulman and Tagnon (126), and Shulman (125). In recent years, the utilization of synthetic substrates such as p-toluene-sulfonylarginine, lysine ethylester, and benzoyl-l-benzoylarginineamide have been investigated by Troll, Sherry, and Wachman (146). In the operating room, recognition of fibrinolytic activity can be simply made by observation of serial blood samples incubated at body temperature with observation of the clotting time by the standard method of Lee-White, as noted by Wintrobe (155).

For many years, serologic methods in the estimation of fibrinolysis involved the measurement of lysis times of plasma clots exposed to varying concentrations of the fibrinolysin. In most instances the fibrinogen preparations used were of bovine origin. Unknown to the investigators, the bovine fibrinogen preparations were contaminated with traces of plasminogen and it remained for Sherry (121, 122), and Troll and Sherry (145), to demonstrate the intrinsic error

in the utilization of this method. Laki (82) described a method for the purification of human or bovine fibrinogen that is available to investigators in this field. It provides a fibrinogen product essentially free of contaminating plasminogen and allows direct measurement of fibrinolytic activity without extraneous influences. In previous studies, the addition of streptokinase to purified solutions of fibrinogen or fibrin without the elaboration of plasmin was held as evidence of the absence of contaminating plasminogen in the preparation. However, since the demonstration of the euglobulin proactivator by Mullertz and Lassen (110), it is now obvious that, contrary to older beliefs, streptokinase does not act directly on plasminogen, but only through the proactivator. Thus, a negative reaction indicates only freedom from proactivator, and not plasminogen. Additional activation with direct activators of tissue, blood, or urinary origin frequently will demonstrate the presence of residual plasminogen. The fact that fibrinogen and fibrin cannot be prepared completely free of plasminogen renders fibrinolytic and fibrinogenolytic methods generally unreliable for the determination of proteolytic activity, but of limited value in the estimation of the concentration of plasminogen activators. The simplest method for the preparation of plasminogen-free fibrin is the heated fibrin plate method as noted by Geiger (54) and Lassen (84). Heating to 80 degrees centigrade for 30 to 40 minutes does not denature the fibrin clot, but does result in the destruction of the plasminogen content as well as other inhibitory agents.

Attention has been directed to the use of plasminogen-free substrates, such as casein and synthetic amino acid esters. Troll, Sherry, and Wachman (146) have described the hydrolytic action of plasmin on p-toluene-sulfonylarginine, lysine ethyl-ester, and benzoyl-l-arginine. The lysin and arginine esters are specific synthetic substrates for plasmin. Trypsin attacks the same esters as plasmin, but demonstrates seven times the esterase effect of plasmin. In the presence of pure plasmin or streptokinase activated plasminogen, the hydrolysis of the synthetic substances is stoichiometric. The degree of hydrolysis is determined by microtitration of the liberated carboxyl groups by the method of Grassmann and Heyde (57). The use of synthetic substrates is relatively recent in this field, and it is probable that utilization of these new techniques will prove fruitful.

The casein hydrolysis methods have been in use for some time and provide a standard, plasminogen-free, spectrophotometric method for the determination of proteolytic activity. The degree of tyrosine liberation from purified casein solution is an expression of the proteolytic activity in the sample studied. Kunitz (81) described the standard technique used in most laboratories. The casein hydrolysis method can be utilized most efficiently in pure systems where exact measurement of fibrinolytic activity is desired, free from the effects of inhibitors.

Shulman (125) has shown that there are other serum constituents that compete with fibrinogen for plasmin. These are prothrombin, plasminogen, platelets, and total protein. The competitive activity of these agents can be considerably reduced by simple dilution, in which the first dilution frequently results in an increased fibrinolytic activity, due to the reduction in concentration of the competing substances.

Fishman and Kline (52) have recently described the preparation of plasmin from highly purified plasminogen. It is obtained by the streptokinase activation of purified plasminogen prepared by the method of Kline (78). It can be finally obtained by alcoholic fractionation, yielding the most potent fibrinolytic preparation thus far reported in the literature. They report the intravenous infusion of up to 1 milligram of plasmin per kilo of body weight in dogs without toxicity. The blood becomes incoagulable within 5 minutes, with return of the clotting time to normal within 24 hours. No changes in body temperature, blood pressure, or the electrocardiogram were noted in their studies. Investigational use of the agent in thromboembolic disease is under way in many medical centers at this time.

Recent clinical studies on the use of intravenous plasmin (actase) have been reported by Moser (108) and Sussman and Fitch (132). From 30,000 to 100,000 units of purified plasmin have been used in a variety of patients with various thromboembolic diseases. Moser found that the duration and intensity of fibrinolytic activity was a function of dosage. At doses above 69,000 units given intravenously, serum fibrinolytic activity could be maintained for 24 hours in the majority of patients. There were no hemorrhagic complications, no profound altera-

tion in coagulation factors, and no instance of embolization secondary to partial digestion and sequestration of the clot. Of 52 patients subjected to plasmin infusions, 49.2 per cent developed febrile reactions with an average temperature elevation of 2.9 degrees Fahrenheit at 10 hours after the infusion. It is noted that the febrile response in patients may be due to the liberation of protein products during the depolymerization of the fibrin clot, rather than to plasmin itself or pyrogens present in the pharmaceutical product. Ambrus (6) has emphasized that after thrombolysis by such agents, rethrombosis may occur after successful clot dissolution. Concurrent heparinization of the subject during clinical thrombolysis with fibrinolytic agents will effectively inhibit intravascular rethrombosis.

Plasminogen

Serum plasminogen is the enzymatic precursor of plasmin. The exact chemical nature of plasminogen is unknown. It may occur as an independent and inactive fibrinolytic molecule or as part of a plasminogen-plasmin-antiplasmin complex. It is present in most mammalian sera, but varies in titer with the species. It occurs in an inactive form in human serum, devoid of intrinsic lytic action, and can be extracted from plasma, serum, or the fraction III of Cohn with relative ease. Several methods of extraction have been described, but in our laboratory the most satisfactory method has been that of Kline (78), yielding a product of exceptional purity and reliability. With this method, one can realize an increase in purity of 400-fold, as compared to the former methods of Christensen and Smith (35) and Remmert and Cohen (114). Crystalline plasminogen in the dry state is an exceptionally stable white powder which retains its activity for 4 to 6 months when stored at minus 20 degrees centigrade.

The activation of plasminogen in human serum is effected by both direct and indirect means. Astrup (11) has termed the directly activating substances "plasminogenases," and the indirect type requiring the presence of an intermediate proactivator "lysokinases." The tissue activator liberated in surgical procedures from injured cells acts directly on plasminogen and forms the chief plasminogenase in the human species. Streptokinase, however, cannot activate plasminogen without the presence of a euglobulin proactivator. The latter again varies with the species, being found in much higher titer in human serum than in bovine material. Mullertz and Lassen (110) have utilized this fact to explain an old paradox in this field. Streptokinase has never been shown to activate bovine plasminogen directly, in vitro or in vivo, whereas, it is the most potent form of plasminogen activation in the human being. The explanation rests on the observations of Geiger (54) and Mullertz and Lassen (110) that streptokinase added to a solution of human globulin is capable of activating human plasminogen. A similar preparation, when added to bovine plasminogen, is also productive of activation, but incapable of plasminogen activation with streptokinase alone. This observation has led to the recent postulation of a proactivator in the euglobulin fraction. The proactivator is responsible for the indirect type of plasminogen activation by various lysokinases, streptokinase being the most potent agent. The proactivator, when activated by streptokinase in human serum, forms a very labile serum activator similar to a spontaneous serum activator and the activators of urine, milk, and tears. The serum activator differs from the tissue activator in many respects, particularly in its stability.

The partial purification and properties of plasminogen were reported by Remmert and Cohen (114). They advised removal of the inhibitor before the determination of plasminogen and by successive isoelectric precipitation secured a partially purified plasminogen product. Soicher, Richards, and Bram (127) reported a plasminogen titer in human beings of 400 to 900 Loomis units per milliliter of plasma. The Kline procedure, as noted previously for the extraction of plasminogen from fraction III of Cohn, has become standard in most laboratories at this time.

Cliffton and Cannamela (38), utilizing Kline's method, have studied the physiological effects of activated plasminogen in dogs and rabbits. The plasminogen administered intravenously appeared to be more fibrinolytic than proteolytic. Fibrinogenolysis was not a prominent feature. The reaction was not inhibited by trypsin inhibitors. In dogs the lytic effect was of short duration, the lysis time returning to normal within 30 to 40 minutes. There was no unusual systemic reaction to intravenous administration. The disappearance of plasmin from the serum may be a result of antiproteolytic action, or due to excre-

tion of plasmin in the urine in conjugate form. It was apparent that the intravenous injection of activated plasminogen did not induce any measure of intrinsic spontaneous proteolysis. The predominant fibrinolytic reaction has suggested the possibility of two or more proteolytic agents in the serum, one agent having the characteristics of plasmin, and the other proteolytic in nature with fibrinogenolytic qualities.

Sherry (121), and Sherry, Titchener, Gottesman, Wasserman, and Troll (124) noted that the intravenous injection of streptokinase in dogs with intra-arterial thrombi resulted in considerable fibrinolysis but little fibrinogenolytic activity. Sherry, Calloway, and Freiberg (123) successfully utilized streptokinase-activated plasminogen in the prevention of postoperative abdominal adhesions in dogs. They noted that in in vitro experiments the streptokinase activation of plasminogen is markedly accelerated in the presence of fibrin clots. The phenomenon is probably due to the absorption of streptokinase and plasminogen on the surface of fibrin. The local, multicentric activation on fibrin results in rapid fibrinolysis. The excess enzyme is exuded into the surrounding plasma where it is inhibited by antiplasmin.

Antiplasmin

There are numerous synonyms in current usage for the description of antiproteolytic activity: simple serum inhibitor, antifibrinolysin, antiproteolysin, antiprotease, and antitryptase. Grob (60) surveyed the literature from 1893 when Hildebrandt (67) first described the phenomenon of antiproteolysis. Hahn (64) later noted that normal human serum manifests antitryptic properties. Landsteiner (83) found antiproteolysin present in the albumin fraction of blood proteins. Opie and Barker (112) suggested that this substance was responsible for the inhibition of fibrinolysin. Dale and Walpole (40) found that chloroform destroys the normal antiproteolytic properties of serum, allowing the proteolytic elements uninhibited activity. Yamakawa (156) suggested that the activation of fibrinolysis by organic solvents is due to the removal of the inhibitor. This was confirmed by Teale and Bach (138) who demonstrated that the inhibitor is removed from the serum by denaturation of the serum protein. Guest, Daly, Ware, and Seegers (62, 63) made a survey of the antiproteolytic properties of various mammalian sera and found considerable variations in titer. However, all mammalian sera demonstrate some degree of antiproteolytic activity. Lewis and Ferguson (85) made a significant contribution by noting no species specificity of antiproteolysins for homologous proteolysins. The canine antiproteolysin was equally as inhibitory for human and bovine proteolysin as for homologous, canine proteolysin. Grob (61) fractionated human plasma by Cohn's methods, and found antitryptic activity chiefly in fractions IV:1 and IV:4.

In 1949 Loomis, Ryder, and George (91) reported the isolation and purification of an antiproteolysin, terming it "antifibrinolysin." It can be prepared from human, bovine, or equine serum and plasma. The substance is a water-soluble, nondialyzable protein, capable of inactivation by heat at 60 to 70 degrees centigrade. It originates in the albumin fraction of serum protein and is stable at a pH above 5.0. It is inhibited by chloroform, ether, thymol, alcohol, and acetone. Various units have been arbitrarily established by various investigators and depend chiefly on the laboratory conditions under which the assay is carried out. The Loomis unit is described as that quantity of antifibrinolysin which will exactly neutralize one unit of fibrinolysin buffered with imidazole at pH 7.2 in one hour at 26 degrees centigrade. The powder is stable at room temperature and in solution at 25 degrees centigrade for several hours. Loomis has proved experimentally that antifibrinolysin is not an antithrombin, antiprothrombin, or antithromboplastin, and does not affect the activity of accelerator globulin or fibrinogen (91).

Shulman and Tagnon (126) investigated the problem of serum inhibition serologically by means of radioactive iodinated fibrinogen. The method presented is extremely sensitive and accurate. In a subsequent paper, Shulman (125) noted the presence of multiple serum inhibitors and concluded that plasmin and trypsin serum inhibitors are distinct agents. He found that the plasmin inhibitor forms only 10 per cent of the total serum inhibitor, the remainder being composed chiefly of trypsin inhibitor.

Jacobsson (71) separated human serum inhibitors by zonal electrophoresis. Two chief inhibitors were isolated, one migrating with the a-1 globulins, and one with the a-2 globulins. He was able by the electrophoretic technique

to quantitate the a-1 and a-2 inhibitors accurately, demonstrating a relatively constant ratio in normal serum of 1 to 9. A-1 inhibitor is strongly antitryptic, while a-2 inhibitor is chiefly antiplasmin, but also manifests antitryptic powers. The sum of the a-1 and a-2 inhibitors was 85 per cent of the total serum trypsin inhibitors. The rate of trypsin inhibition by a-1 and a-2 inhibitors is directly proportional to the amount added up to 70 per cent inhibition. At higher concentrations the inhibition per unit of inhibitor is decreased, implying that the inhibition is reversible and the dissociation constants are small. In his clinical studies Jacobsson found the a-1 inhibitor elevated in conditions of tissue destruction; i.e., metastatic malignancy and acute bacterial infections. The a-2 fraction was found unusually elevated in nephrosis, with a corresponding decrease in the a-1 fraction. Jacobsson states that the a-1 inhibitor is probably a mucoprotein or glycoprotein, substances known to be increased in acute infections and carcinoma. The trypsin-inhibiting properties of serum have no direct correlation with plasmin inhibition. The serum antitrypsin titer in no way reflects the antiplasmin characteristics of the identical serum sample. Meyers, Burdon, and Riley (101), in studying a series of surgical patients, postulated that whole serum antitryptic activity may reflect a potential antiproteolytic state existing in vivo, rather than the determination of fractionated antiproteolytic agents. However, in the series, they found no variation greater than 10 per cent of the arithmetical mean value for serum trypsin inhibitor.

The mode of enzymic inhibition of the proteolysin by antiproteolysin is unknown. It has been postulated that an inactive complex of both enzymes is formed during inhibition, but it is equally possible that actual alteration of the chemical nature by plasmin takes place. Cliffton (36) has remarked that it is apparent in surgical patients that a rise in the antiproteolytic titer is always secondary to a rise in proteolytic activity. This feature was very evident 2 to 4 days after operation in the cases cited when a considerable increase in antiproteolytic titer of the serum was noted.

In 1953, Johnson and Schneider (74) described marked antiproteolytic activity in the platelet fraction of bovine blood and suggested that antiproteolytic titer may be stored in or related to platelets. Stefanini and Murphy (130) reported instances of increased antiproteolytic titer in cases of thrombocytosis. In addition, they noted fibrinolytic phenomena in subjects manifesting thrombocytopenia. The implication is thus clear that a direct relation between platelet production and antiproteolysis may exist. Ungar, Damgaard, and Hummel (149), and Ungar and Damgaard (148) approached the problem in a unique manner when they became concerned with the role of the spleen in antiproteolysis. They described two splenic extracts, splenin A and splenin B, which were believed to have some bearing on the maintenance of the circulating antiproteolysin. They demonstrated in guinea pigs that the spleen is essential to the production of antiproteolysin during stimulation of the animals with ACTH or adrenal hormones. After splenectomy the subjects no longer responded to the hormones with increased antiproteolysin production. In addition, following splenectomy, administration of splenin A restored the antiproteolysin titer on administration of anterior pituitary and adrenal hormones. Splenin B appeared to depress antiproteolysin production. Ungar made no reference to platelets in his studies and it is possible that his splenic extracts as described contained considerable antiproteolytic activity. No further pertinent physiological studies on the relation of the spleen to antiproteolysis have appeared in the literature, although isolated clinical reports of acute fibrinolytic phenomena occurring after splenectomy are in evidence. Gormsen (56) described 2 patients subjected to splenectomy who died postoperatively of fatal hemorrhages secondary to active fibrinolysis.

Many investigators have attempted to correlate serum inhibitor with various pathological states. Guest, Daly, Ware, and Seegers (62) devised a serologic method for the determination of antifibrinolysin and found increased values in malignant conditions, pregnancy, postsurgical states, and various acute medical conditions, chiefly infections, myocardial infarction, and anemia. Cliffton (36), Shulman (125), and Jacobsson (72) essentially confirmed these studies and came to the general conclusion that the rise in antiproteolysin is a nonspecific reaction and has no value as a specific diagnostic test. The common feature to all actively antiproteolytic sera is the destruction of tissue.

A study of antiproteolysis would not be complete without some description of specific chemical substances having antiproteolytic properties. Heparin, soybean, navy bean, and lima bean inhibitors are the chief products of this type. Astrup and Alkjaersig (12) have attempted to classify proteolytic enzymes by means of these inhibitors. Soybean inhibitor is in most common usage clinically. In 1946 Kunitz (80) reported the isolation of crystalline soybean inhibitor. He found the reaction between trypsin and soybean inhibitor to be stoichiometric and instantaneous, forming a trypsin-soybean inhibitor complex. In 1953 Jacobsson (71) noted that urea caused dissociation of the trypsin-soybean inhibitor complex. At pH 7.6 and in the presence of calcium, the amount of trypsin inhibited is directly proportional to the amount of soybean inhibitor added. Under the conditions described by Jacobsson (72) 1 microgram of soybean inhibitor inhibits 1.85 micrograms of crystalline trypsin. Christensen (32) found that 1 cubic centimeter of human serum inhibits an average of 655 micrograms of trypsin. Peacock and Sheehy (113) found an average inhibition of 1,000 to 1,700 micrograms of trypsin under similar conditions.

Tissue kinase

From the surgical point of view, the chief interest in fibrinolysis should lie in the phenomenon of tissue activation. There is ample experimental evidence to demonstrate that considerable amounts of tissue kinase, or activator, are liberated locally at the operative site as a result of tissue injury. The activation of plasminogen by tissue kinase is direct and is identical to the activator described in human milk by Astrup and Sterndorff (20); in urine by Astrup and Sterndorff (19); in human tears by Storm (131); and in saliva by Albrechtsen and Hess-Thaysen (3). The chemical nature of activator is unknown, although it is patently enzymatic in character and of protein origin.

Historically, Demuth and Riesen (43) were the primary investigators to suggest the activation of a humoral proteolytic system by means of tissue activators. It remained for Astrup and Darling (14), Astrup and Permin (16,17), and Astrup (8) to demonstrate conclusively that all tissues contain activating substances of protein nature capable of converting plasminogen to plasmin enzymatically. It therefore became evident that with surgical or traumatic injury to tissue cells an activator is liberated into the tissue spaces and the general circulation which reacts stoichiometrically with plasminogen to form an active fibrinolytic agent. The activation process may be local or general in character. Locally, if sufficient antiproteolytic material is present in the adjacent tissues and plasma, the reaction may be confined homeostatically. With more potent forms of activation the antiproteolytic forces may be overcome locally and the reaction rapidly becomes generalized and humoral in its effects. Clinical evidence of surgical plasminemia then becomes manifest.

Astrup (7, 8, 9), and Astrup, Crockston, and MacIntyre (13) made a study of tissue activator in various mammals and found the highest titers in the pig heart, human lung, and brain. They first suggested the term "fibrinokinase." The later studies of Tagnon and Peterman (135), Tagnon and Palade (134), and Lewis and Ferguson (86) confirmed the presence of tissue activator. The last two workers pointed out that no mammalian species specificity for human, feline, canine, bovine, and mouse tissue kinases are interchangeable in standard serologic tests.

Streptokinase, however, was observed to be the most potent activator of canine plasminogen. In addition, the thromboplastic and tissue kinase activities were noted to be independent despite their coexistence in the crude tissue fractions. Astrup and Stage (18) have developed a quantitative method for the extraction of tissue kinase, reporting an average yield of 100 milligrams of kinase per gram of tissue extracted. In a purely experimental system, the degree of activation of plasminogen is directly proportional to the concentration of the activator. Tagnon and Palade (134) have described the presence of tissue inhibitor with activator, and in differential centrifugation studies it is possible to separate the agents, the activator being present in the particulate matter and the inhibitor in the supernatant.

The physical properties of tissue kinase are characterized by considerable lability at room temperature, their activity being completely lost in 4 hours at 37 degrees centigrade. Raising of the temperature increases the rate of deterioration with complete loss of activity at 56 degrees centigrade in 30 minutes. Storage at minus 20 degrees centigrade will preserve the activity for 4 to 8 weeks.

From a practical standpoint it is evident that any form of tissue disruption, from simple skin incision to severe trauma, results in the conversion of plasminogen to plasmin as a result of the elaboration of tissue activator. The degree of plasminemia produced, however, is extremely variable, and may be considered proportional to the degree of tissue injury and the amount of antiproteolysin circulating. In the studies of Lewis and Ferguson (86) the plasminogen activator was isolated from homogenized tissue by differential centrifugation methods. The greatest concentration of activator was found within the microsome fraction. It has been postulated by Halse (65) that the activating substance may be of phospholipid origin, for in asphyxiated experimental animals he found increased blood phosphatides. Berg (25) confirmed Halse's studies in cases of adrenalin and electric shock therapy.

Macfarlane (92) and Macfarlane and Biggs (93) made a brilliant series of studies in surgical patients and demonstrated an abrupt rise in serum fibrinolytic activity during routine surgical procedures. They found, however, that they could not uniformly correlate the degree of fibrinolytic activity with the severity of surgical trauma. In addition, it was found in several instances that relatively high preoperative fibrinolytic values were correlated with preoperative anxiety. These observations were later confirmed and amplified by Imperati (69), Tagnon, Levenson, Davidson, and Taylor (133), Von Kaulla (150), Rocha e Silva, Andrade, and Teixeira (115), Cliffton (36), Scott, Matthews, Butterworth, and Frommeyer (118), and Meyers, Burdon, and Riley (101).

Halse (65), Macfarlane and Biggs (93), and Biggs, Macfarlane, and Pilling (27) showed that following severe exercise and/or the injection of adrenalin the serum became actively proteolytic. From these studies it was postulated that the lysin produced under conditions of stress was plasmin or a plasmin-like proteolysin. Also it was noted that the lysin manifested in the blood of athletes after severe exercise had no tendency to digest fibrinogen, even though there was a concomitant and rapid loss of fibrin. Also the lysin was unaffected by the serum inhibitor of plasmin. It is thought that the lysin of severe exercise is more characteristic of the postmortem cadaver lysin of Mole (105) and Halse (65). This fact lends credence to the concept of multiple and independent lysins of humoral origin.

Streptokinase. In previous paragraphs the historical aspects of streptokinase were reviewed from the original observation of Tillet and Garner (141) on the lytic character of streptococcal bacterial filtrates. Christensen and MacLeod (34) first coined the term "streptokinase" and described the activation of plasminogen by this agent.

Streptokinase is available commercially as "varidase," a preparation composed of streptokinase and streptodornase extracted from cultures of group C hemolytic streptococci. Christensen (32) described the preparation of streptokinase and streptodornase by means of ultracentrifugation and ethanol precipitation at low temperatures. The final, partially purified product contained significant amounts of impurities that were thought responsible for clinical pyrogenic and hypotensive reactions. Tillet, Johnson, and McCarty (142) observed considerable amounts of extraneous protein in streptokinase-streptodornase (SK-SD) preparations and found streptokinase to form only 10 per cent of the total protein in standard varidase preparations. In addition to streptodornase, hyaluronidase and ribonuclease were present in smaller quantities. The ratio of streptokinase to streptodornase in varidase is 4 to 1. Fletcher and Johnson (53) have described improved methods for the purification of SK-SD preparations by means of starch zone electrophoresis and improved chemical fractionation. With zonal electrophoresis a 6 to 7 fold increase in purity can be realized. Chemical fractionation, as described, gave a 4 to 5 fold purification. Immunochemical analysis revealed the presence of persistent impurities which are believed to be actively antigenic in nature. A series of ultracentrifugation observations revealed two components for streptokinase, 88 per cent of the sample with a molecular weight of 50,000 and a second component averaging 15,000.

The clinical application of such purified streptokinase preparations has been reported by Johnson, Fletcher, McCarty, and Tillet (73). The streptokinase purified by zonal electrophoresis was shown to have greatly reduced toxicity when administered intravenously in man. The purified product was found to have one-twentieth of the toxicity of former preparations. In 128 infusions of streptokinase to 61 pa-

tients it was shown conclusively that toxic effects such as hypotension, pyrexia, and malaise were due to impurities in the product rather than to the intrinsic nature of the streptokinase itself. Considerable fibrinolytic activity was noted in patients humorally without significant subjective distress. It was concluded that activation of the proteolytic system in man is unaccompanied by clinical symptomatology of note. The last named workers have therefore augmented the studies of Tillet, Johnson, and McCarty (142) who recognized the value of intravenous streptokinase administration in man, but decried the pyrogenic and hypotensive effects of impure preparations. In a series of patients given 75,000 to 150,000 units of streptokinase by continuous or intermittent intravenous infusion, no major hematologic effects were noted other than transient leucocytosis and irregular variation in platelet counts. No changes in bleeding and clotting times were noted, but spontaneous bleeding was noted at times at the site of needle puncture. The prothrombin times were prolonged in patients with low natural inhibitor. When considerable fibrinolytic activity was induced in low inhibitor patients, there was a concomitant decrease in fibrinogen, plasminogen, and complement. In patients with high titers of natural inhibitor, no changes in plasma fibrinogen were noted with active fibrinolysis. Patients subjected to serial infusions of streptokinase manifested considerably more fibrinolytic activity of longer and greater intensity than those given only single injections. It is apparent that effort should be directed toward even greater purification of streptokinase before a completely acceptable pharmaceutical product can be recommended for intravenous administration.

The problem of streptokinase unitage has been difficult because of a variety of assay methods and variations in the preparation of plasminogen. Many units have been proposed, one of the earliest and best being the Christensen unit advocated in 1949 (32). Wassermann, Ciminera, Hayflick, and Verwey (153) have been concerned with the conflicting methods in the quantitative determination of streptokinase and have proposed an improved method. It requires a streptokinase reference standard and rigid laboratory standardization of all reagents used in the assay.

This article is not concerned with the therapeutic aspects of streptokinase administration, but for the purpose of completeness a general survey of current methods of therapy is appended. Streptokinase was first used in combination with streptodornase for the dissolution of pleural exudates, as originally noted by Tillet and Sherry (143). Subsequently the method was adapted to the chemical and enzymatic debridement of infected wounds by a number of workers (39, 96, 98, 99, 139, 144). In general, the method is a refinement of the original maggot therapy of Baer (22) who attributed the debridement to the action of various proteolytic agents present in the maggot, such as peptidase, tryptase, collagenase, and lipase. The plasminogen-activating qualities of streptokinase and the depolymerizing effect of streptodornase on nucleoprotein have been adapted to the treatment of hemothorax (97), pleural exudation (143), burns (140), sinus tracts, (128) and chronic ulcers (96). A review of the therapeutic use of such enzymatic agents was presented by Cliffton (37).

In 1957 several modifications of streptokinase administration were suggested. Miller (102) has introduced the concept of the anti-inflammatory action of streptokinase when given simultaneously with antibacterial drugs. It is thought that the induction of serum fibrinolytic activity reduces the protective fibrin wall about an area of inflammation, allowing the antibacterial agent to penetrate into the infected area to reduce the number of bacterial invaders. The dissolution of local fibrin deposits enhances the local vascular and lymphatic circulation and allows more effective immunological activity. Finally, Miller, Godfrey, Ginsberg, and Papastrat (103) have described beneficial results with the use of streptokinase administered buccally. Of 62 cases of various chronic inflammatory states, 59 showed significant reduction in inflammation and local edema when tablets of streptokinase containing 10,000 units were given to the patients buccally. Each patient was given one tablet twice daily for a minimum of 3 days. No description of the effect of buccally administered streptokinase on the serum fibrinolytic activity was given. It is concluded that a significant clinical effect can be produced by this method. Innerfield, Shub, and Boyd (70) have published their clinical and experimental observations on buccally administered streptokinase. Serum antithrombin titers were found to vary proportionately with the serum proteolytic activity. Higher antithrombin values were found in patients undergoing prolonged therapy with

streptokinase given buccally. In a series of 74 patients manifesting various inflammatory states (hematoma, thrombophlebitis, leg ulcers, chronic bronchitis, and bronchiectasis) a rapid reduction of inflammatory edema and tenderness was noted. They conclude that the buccal or sublingual route is clinically feasible.

In 25 years of research since the discovery of the streptokinase principle by Tillet and Garner (141), very little has been learned of the specific chemical nature of the substance. Its role in the elaboration of plasmin has been established, and it is recognized as the most potent activator of plasminogen. Refinement in the methods of purification has developed a product that is more pharmacologically acceptable. The therapeutic value of streptokinase alone or in conjunction with plasminogen for the treatment of thromboembolic disease, infected wounds, and burns is at this writing quite well established. However, the presence of serum antistreptokinase and the frequent pyrogenic reactions reported following the intramuscular or intravenous use of streptokinase may limit its use for the effective induction of serum fibrinolytic activity in man.

Urokinase. The phenomenon of spontaneous lysis of clotted blood within the urinary passages is commonly observed. It is clinically obvious that a homeostatic mechanism exists for the physiologic removal of fibrin from the urinary tract after spontaneous or surgically induced hemorrhage. Following the formation of a fibrin clot within the renal pelvis or urinary bladder, relatively rapid lysis of the clot is apparent within 24 to 48 hours, provided no fresh hemorrhage develops.

Interest in the lytic activity of normal urine has developed in the past 50 years with the evolution of the concept of proteolysis and antiproteolysis. Sahli (117), Brodzki (29), and Baumann (24) originally described proteolysis of casein and albumin in urine samples. Macfarlane and Pilling (94) first reported urinary fibrinolytic activity in subjects manifesting evidence of serum fibrinolysis. Complete lysis of fibrin clots occurred within 24 hours in urine dilutions up to 1 to 4,000. They devised a method of extraction of the urinary lytic principle and found it to be active at a pH of 7.4, nondialyzable, and of protein origin. Considerable proteolytic activity against fibrinogen, fibrin, albumin, and casein was noted by means of a tyrosine assay method. The urinary lytic agent was effectively inhibited by antifibrinolysin and soybean inhibitor. Originally, Macfarlane and Pilling concluded from their studies that the lytic agent in the urine was directly fibrinolytic in nature. However, from the additional studies of Williams (154), Bjerrhus (28), and Astrup and Sterndorff (19, 21), it became obvious that the agent was in essence an activator of plasminogen excreted in the urine as a normal constituent. Simple addition of fresh urine to purified fibrinogen systems did not result in lysis of fibrin clots. With the addition of significant amounts of plasminogen to the purified fibrinogen system, rapid lysis was observed uniformly. It therefore became apparent that the presence of plasminogen is necessary for the lytic activity of normal urine, and that actual lysis is induced by a urinary activator that converts plasminogen to plasmin similar to the development of serum proteolysis.

Astrup and Sterndorff (19, 21) have devised an excellent method for the extraction of urinary activator and reported a yield of 800 milligrams of activator per liter of normal urine. The urinary activator is a soft, amorphous, white powder of protein origin, active at an optimum pH of from 7.2 to 7.6. Contrary to tissue activator that is bound to structural proteins and highly insoluble in mundane solvents, urinary activator is extremely soluble in aqueous solutions. It can be precipitated by the common protein-precipitating agents, such as ammonium and sodium sulfate, acetone, and ethyl alcohol. It is extremely heat labile, being denatured at temperatures above 60 degrees centigrade. It is also very labile in solution, but can be stored for months in the dry state at −20 degrees centigrade. It is inhibited by antiplasmin, soybean inhibitor, and cetylpyridinium chloride, these agents effecting complete inhibition in dilutions as low as 0.1 per cent.

Urinary activator is capable of directly activating plasminogen in a stoichiometric fashion to form an active proteolysin, identical in behavior to plasmin. The addition of plasminogen to a plasminogen-free system containing urine produces a linear lytic response that is proportional to the concentration of the plasminogen added. Bjerrhus (28) noted a precipitous decline in the concentration of urinary activator after hepatectomy in experimental mammals. Gastrectomy had no such effect on urinary activator, which indicated that it is not associated with pepsin enzymatic activity.

A recent study in our own laboratory of the spectroscopic characteristics of urinary activator

reveals no characteristic absorption pattern in the visual range, but in the ultraviolet range a specific peak was noted at 275 mu. This indicates the nonspecific protein nature of urinary activator. No photocolorimetric method for the detection of urinary activator is believed feasible at present because of the large amount of protein substances in the urine and the lack of a purified form of the activator. Celander, Langlinais, and Guest (30) have reported a greater concentration of urokinase in the urine foam after shaking it for several minutes. They found 10 to 40 times more urokinase activity in the foam than in the liquid portion of the urine. The significance of the phenomenon is not well understood. In addition, Kolmen, Guest, and Celander (79) have noted the capacity of washed human red cells to absorb urokinase. They found that suspensions of red blood cells exposed to potent urokinase concentrations rapidly take up urokinase at pH 8.0. It was found that not only intact red blood cells, but the red cell stroma would also absorb urokinase.

Bjerrhus (28) reported no sex difference in the concentrations of urinary activator from 114 normal patients. However, both Bjerrhus (28) and Williams (154) have noted a direct relation between the concentration of urinary activator and the state of hydration of the individual. Increase of the rate of urinary excretion directly reduces the concentration of urinary activator per unit volume.

No therapeutic use has been made of the urinary activator up to the present time. Streptokinase provides significantly more plasminogen activation than urokinase, and is so readily available that it provides a much more efficient agent for the induction of fibrinolysis. Sgouris, McCall, and Inman (120), in comparing the activating potencies of streptokinase and urokinase, found that urokinase provides considerable activation of plasminogen, but at one-seventeenth of the potency of streptokinase.

Uroinhibitors may be found in association with urinary plasminogen activators. Dillard (46) described the phenomenon and noted the specific inhibitory effect of urine on trypsin. Astrup and Sterndorff (21) considered that a urinary trypsin inhibitor might interfere with assay of the urinary activator. They described an excellent method of separating the two substances in the urine. The final product was stable in solution when stored in the icebox with toluene. It is stable at pH 3 to 4, but loses potency rapidly in neutral and alkaline reactions. It is relatively thermostable at high temperatures. A study of the effect of a uroinhibitor on plasminogen activators was carried out with trypsin, tissue activator, and serum activator prepared from human serum by the addition of streptokinase. Also the effect of a uroinhibitor on various proteolytic enzymes was studied. It was apparent that the inhibitor acts specifically on trypsin, with slight inhibition of chymotrypsin and bovine plasmin. No significant inhibitory effect was noted on the activity of plasminogen activators. The inhibitor is present in very low concentration in urine so that it can be estimated only in concentrated solutions. Preparations of urinary inhibitor must be concentrated 6 to 8 times. The concentration of uroinhibitor in normal urine is roughly equivalent to neutralization of the activity of an equal volume of solution containing 25 milligrams of Armour trypsin per liter.

SIGNIFICANCE OF FIBRINOLYSIS IN SURGERY

The development of plasminemia in surgical states is probably as physiologically homeostatic as the process of coagulation, but less fully understood. It is apparent from the rapidly accumulating, contemporary, medical literature that the concept of serum proteolysis and antiproteolysis is of considerable significance in surgery, not only in the treatment of thromboembolic phenomena and coagulation defects, but in an understanding of the physiology of wound repair.

The actual induction of serum fibrinolysis in surgical states may be considered as a local or general process dependent entirely on the degree of activation of plasminogen initially by liberated tissue activator. In addition, the intrinsic antiproteolytic titer of the individual is of equal importance in localizing and inhibiting exuberant fibrinolytic factors in operation. In the majority of surgical procedures some degree of fibrinolytic activity can be detected clinically by suitable laboratory techniques. Surgical procedures on specific organs, such as the prostate, lung, uterus, and pancreas, can, at times, induce strong fibrinolytic activity because of the unusually high tissue activator present in these organs. Despite the variation in tissue activator present in all mammalian tissues, the development of fibrinolytic activity is a well controlled process in the majority of surgical procedures. It provides a homeostatic, protective mechanism developing in re-

sponse to local tissue injury and concerned with the intrinsic processes of tissue repair. Instances of intense, dithyrambic activation of plasminogen have been noted clinically, particularly in pulmonary, uterine, prostatic, and pancreatic surgical procedures. In these catastrophies, there is rapid depletion of the local and systemic antiproteolytic forces with the development of a generalized coagulation defect of serious nature.

The initiation of such a generalized fibrinolytic phenomenon has been correlated with the "alarm reaction" of Selye (119), and, as noted previously, Ungar and Damgaard (148) have demonstrated pertinent relationships to pituitary, splenic, and adrenal factors involved in the maintenance of antiproteolytic forces. An acute, fulminant fibrinolysis can produce a rapid and total deterioration of the coagulation mechanism on the operating table. Rapid depolymerization of fibrin, fibrinogen, prothrombin, antiplasmin, and possibly platelets is evident from numerous clinical observations. Such a clinical phenomenon serves no physiological purpose and represents a true pathological entity with serious implications if unchecked.

Investigators in the field of serum fibrinolysis and antifibrinolysis have recently evolved a new and unique concept of the pathogenesis of arteriosclerosis. Mole (105) was first to note a possible relationship between the deposition of mural fibrin in arterial vessels, reduced fibrinolytic activity in the serum, and the subsequent development of arteriosclerosis. Duiguid (47, 48, 49) and Rokitansky, as cited by Astrup (10), originally believed that arteriosclerotic narrowing of the arterial vessels is caused by deposition of parietal fibrin with subsequent re-endothelialization of the vascular lumen. The gradual secondary fibroblastic organization of the fibrin deposits results in intimal proliferation and gradual narrowing of the lumen. Both Mole (105) and Astrup (10) emphasize the possible relation of arteriosclerosis to gradual depletion of the fibrinolytic mechanism with age, and suggest that the vascular changes may be due to an imbalance between the fibrinolytic and antifibrinolytic forces in advanced age. When deposition of fibrin occurs in the arterial intima, the underlying intimal tissues may necrose because of impaired nutrition unless active fibrinolytic agents remove the pathologic fibrin. The active endothelial proliferation may cover the defect, and the subsequent fibroblastic reaction with deposition of calcium salts ensues in the wall of the vessel. The concept has received added support from a striking study on the inhibition of serum fibrinolysis by alimentary fat by Greig (59). He showed that the ingestion of fatty meals in human beings is followed by a distinct reduction in the serum fibrinolytic activity. It was noted that the degree of inhibition of fibrinolysis is proportional to the degree of lipemia produced. Exercise taken postprandially had a very beneficial effect on serum fibrinolytic activity. The study confirms Duiguid's original conviction and supports the work of Ancel Keys (76, 77) on the relation of coronary sclerosis to high fat diets. Barnard and Barnard (23) believe the inhibition of fibrinolysis in Greig's cases may be due to lecithinemia. They showed that, in vitro, fibrinolysis is inhibited by solutions of crude soybean oil or purified soybean lecithin. It remains to be demonstrated whether the, in vitro, inhibition is due to lecithin or the intrinsic inhibiting qualities of soybean inhibitor as noted by Kunitz (80).

RECOGNITION AND TREATMENT OF SURGICAL FIBRINOLYSIS

The majority of instances of pathologic reduction of plasma fibrinogen in surgical states is secondary to the activation of serum proteolysins or to intravascular defibrination phenomena seen particularly in obstetrical problems associated with premature separation of the placenta. In the latter condition, the liberation of pathologic amounts of placental thromboplastin is believed responsible for the intravascular coagulation and humoral dissipation of fibrin. In surgical fibrinolysis no thromboplastic factor is evident, the reduction in plasma fibrinogen being due to depolymerization of fibrinogen by the activated proteolysin, plasmin. Clinically, the plasma fibrinogen level reflects the degree of proteolytic activity. Plasma levels below 125 to 150 milligrams per cent are significant and will be accompanied by prolongation of the clotting time and gross changes in clot formation and consistency. Locally there is considerable bloody ooze from the wound margins and all abraded surfaces. Blood clots, if formed at all, are small, pale, and poorly retracted. If the condition remains undetected or unchecked, signs of surgical shock may ensue. Treatment of the condition must be equally as rapid and definitive as the recognition. Three main objectives must be considered in such a state, the replacement of depleted plasma fibrinogen, the inhibition of fibrinolytic activity, and the pre-

vention of shock. Confirmation of the existence of surgical fibrinolysis can be made by simple observation of a Lee-White clotting time in several blood samples drawn at the operating table.

A simple rule of thumb for the Lee-White method involves the close observation of the common, unoxalated blood sample. No observable clotting indicates a probable plasma fibrinogen level of less than 60 milligrams per cent. A translucent, poorly formed clot manifesting no lysis within 30 minutes suggests a fibrinogen level of 80 to 120 milligrams per cent. Normal clot formation without evidence of lysis after 30 to 60 minutes of observation indicates a normal plasma fibrinogen level. Such observations can be made in the operating room while awaiting the confirmatory procedures, such as the routine circulating plasma fibrinogen, actual measurement of the fibrinolysin titer (15, 62, 89, 126, 149, 152), or the determination of serum antithrombin as described by Innerfield, Shub, and Boyd (70).

When the diagnosis of acute fibrinolysis secondary to a surgical procedure is even suspected, immediate therapeutic steps should be taken while the diagnosis is being confirmed in the laboratory. If a transfusion is or has been in progress, the possibility of a hemolytic reaction should be immediately ruled out. Every effort must be made to restore the blood volume to normal levels to prevent shock, since it is an additional source of plasminogen activation. Human fibrinogen given intravenously is the therapeutic agent of choice, plasma and whole blood being of secondary and tertiary effectiveness. A single unit of human fibrinogen is equivalent to 1,000 milligrams of fibrinogen. Plasma provides intermediate amounts of fibrinogen, 200 to 400 milligrams per 100 cubic centimeters.

Human fibrinogen, fraction I of Cohn, should be given intravenously in 2 to 6 gram quantities in the average case with sufficient whole blood to restore the blood volume to normal levels. In profound hypofibrinogenemic states, with plasma fibrinogen below 80 to 100 milligrams per cent, it may be necessary to give larger amounts of fraction I. One unit of whole blood contains only 600 to 700 milligrams of fibrinogen, so that when a severe hypofibrinogenemia exists and human fibrinogen is not available, multiple transfusions are necessary. In cases requiring 2,000 to 4,000 cubic centimeters of stored blood there is an added hazard in the potential development of thrombocytopenia due to platelet-poor, aged, bank material. The use of plastic transfusion bags or siliconized transfusion bottles will help reduce the loss of platelets in stored blood.

There is an additional hazard in the use of intravenous human fibrinogen, for there is a significant incidence of homologous serum jaundice following the use of such fractionated blood protein. In the presence of a catastrophic coagulation problem the risk of severe and even fatal homologous serum jaundice must be weighed against the obvious therapeutic advantages of fraction I. The possibility of the development of homologous serum jaundice is estimated to be at least equal to, and may exceed, that of pooled plasma.

The therapeutic enhancement of antifibrinolytic activity is poorly understood at present, but considerable physiologic effect can be realized from the use of ACTH and/or adrenocortical extracts. Reference to the work of Ungar and Damgaard (148) and Stefanini and Dameshek (129) lends credence to the concept that the serum antifibrinolysin can be significantly augmented in this fashion. ACTH given intramuscularly in doses of 20 to 40 units is recommended as an immediate measure. Intramuscular cortisone acetate or intravenous hydrocortisone in 100 to 200 milligram initial doses may prove of dramatic benefit in some cases.

The use of soybean, navy bean, and lima bean inhibitors has been reported by several investigators (80, 136, 137). No comprehensive clinical evaluation of this form of therapy has appeared in the literature. Toluidine blue has also been advocated in the inhibition of various hemorrhagic states by several investigators, chiefly Allen and his coworkers (4, 5). Toluidine blue has an antiheparin-like action. Mendes Fagundes (100) has shown that, in vitro, toluidine blue in a concentration of 0.04 milligrams per cubic centimeter of blood will sharply reduce the coagulation time. In concentrations above this level, an anticoagulant effect is noted. Allen and Jacobson (5) and Allen, Bogardus, Jacobson, and Spurr (4) have demonstrated the value of toluidine blue in hemorrhagic states associated with exposure to ionizing radiation and in thrombocytopenia. Lombardo (88) has recorded significant inhibition of fibrinolysis by toluidine blue in a series of 30 patients undergoing transurethral resection of the prostate gland. The usual dose is 2 to 4 milligrams of toluidine blue per kilo of body weight, given orally or intravenously, and daily as long as the hemorrhagic state persists. Bickers (26) re-

ports considerable reaction from the dye, such as nausea, vomiting, vertigo, paresthesias, nystagmus, hyperhidrosis, mental excitation, and, most commonly, vesical irritation secondary to the urinary excretion of the drug.

SUMMARY

An understanding of the pathophysiologic nature of serum fibrinolysis and antifibrinolysis is essential to contemporary surgeons. The foregoing dissertation has been concerned in considerable detail with factors responsible for the induction of surgical fibrinolysis in the operating theater. Clinical recognition and therapeutic control of the condition are emphasized. A brief historical review of the development of the concept of serum fibrinolysis and antifibrinolysis from the time of Morgagni (1769) and John Hunter (1794) is presented.

REFERENCES

1. Abderhalden, E., and Abderhalden, R. Weitere Studien uber das Wesen der sogenannten "Abderhaldenschen Reaction" Fermentsforschung, 1921, 4: 338.
2. Ablondi, F. B., and Hagan, J. J. Comparison of certain properties of human plasminogen, and proactivator. Proc. Soc. Exp. Biol., N.Y., 1957, 95: 195.
3. Albrechtsen, O. K., and Hess Thaysen, J. Fibrinolytic activity in human saliva. Acta physiol. scand., 1955, 35: 138.
4. Allen, J. G., Bogardus, G., Jacobson, L. O., and Spurr, C. L. Some observations on the bleeding tendency in thrombocytopenic purpura. Ann. Int. Med., 1947, 27: 382.
5. Allen, J. G., and Jacobson, L. O. Hyperheparinemia—cause of hemorrhagic syndrome associated with total body exposure to ionizing radiation. Science, 1947, 105: 388.
6. Ambrus, J. L. Clinical and experimental studies on fibrinolytic enzymes. Ann. New York Acad. Sc., 1957, 68: 97.
7. Astrup, T. Fibrinolytic enzymes. Tr. 1st Conf., Blood Clotting and Allied Problems. Josiah Macy, Jr. Found. 1948, p. 28.
8. Idem. The activation of a proteolytic enzyme in blood by animal tissue. Biochem. J., Lond., 1951, 50: 5.
9. Idem. Fibrokinase. Acta physiol. scand., 1951, 24: 267.
10. Idem. The biological significance of fibrinolysis. Lancet, Lond., 1956, 271: 565.
11. Idem. Fibrinolysis in the organism. Blood, N. Y., 1956, 11: 781.
12. Astrup, T., and Alkjaersig, N. A contribution on the classification of the proteolytic enzymes by means of their inhibitors. Nature, Lond., 1952, 169: 314.
13. Astrup, T., Crockston, T., and MacIntyre, A. Proteolytic enzymes in blood. Acta physiol. scand., 1950, 21: 238.
14. Astrup, T., and Darling, S. Contributions to the chemistry of prothrombin. Acta physiol. scand., 1943, 5: 97.
15. Astrup, T., and Mullertz, S. Fibrin plate method for estimating fibrinolytic activity. Arch. Biochem. and Biophys., 1952, 40: 346.
16. Astrup, T., and Permin, P. M. Fibrinolysis in the animal organism. Nature, Lond., 1947, 159: 681.
17. Idem. Fibrinokinase and fibrinolytic enzymes. Nature, Lond., 1948, 161: 689.
18. Astrup, T., and Stage, A. Isolation of soluble fibrinolytic activator from animal tissue. Nature, 1952, 170: 929.
19. Astrup, T., and Sterndorff, I. An activator o plasminogen in normal urine. Proc. Soc. Exp. Biol., N. Y., 1952, 81: 675.
20. Idem. A fibrinolytic system in human milk. Proc. Soc. Exp. Biol., N. Y., 1953, 84: 605.
21. Idem. The plasminogen activator in urine and the urinary trypsin inhibitor. Scand. J. Clin. Lab. Invest., 1955, 7: 239.
22. Baer, W. S. Treatment of chronic osteomyelitis with maggots. J. Bone Surg., 1931, 13: 438.
23. Barnard, R. D., and Barnard, J. F. Fibrinolysis and lipemia. Lancet, Lond., 1956, 271: 516.
24. Baumann, J. Experimentelle Untersuchungen zur Frage der "Trypsinvergiftung" bei akuter Pankreasnekrose. Zschr. ges. exp. Med., 1933, 91: 120.
25. Berg, S. P. Das postmortale Verhalten des Blutes. Zschr. Gerichtlich. Med., 1950, 40: 1.
26. Bickers, W. Toluidine blue, an evaluation in the treatment of uterine bleeding. Am. J. Obst., 1953, 66: 1313.
27. Biggs, R., Macfarlane, R. G., and Pilling, J. Fibrinolysis; experimental activity produced by exercise or adrenalin. Lancet, Lond., 1947, 1: 402.
28. Bjerrhus, I. The fibrinolytic activity of urine. Scand. J. Clin. Lab. Invest., 1952, 4: 179.
29. Brodzki, J. Ueber urotryptische Fermente. Zschr. klin. Med., 1907, 63: 537.
30. Celander, D. R., Langlinais, R. P., and Guest, M. M. The application of foam technique to the partial purification of a urine activator of plasma profibrinolysin. Arch. Biochem. and Biophys., 1955, 55: 286.
31. Christensen, L. R. Streptococcal fibrinolysis: a proteolytic reaction due to a serum enzyme activated by streptococcal fibrinolysin. J. Gen. Physiol., 1945, 28: 363.
32. Idem. Methods for measuring activity of components of the streptococcal fibrinolytic system and streptococcal desoxyribonuclease. J. Clin. Invest., 1949, 28: 163.
33. Idem. Action of proteolytic enzymes on casein proteins. Arch. Biochem. and Biophys., 1954, 53: 128.
34. Christensen, L. R., and MacLeod, C. M. A proteolytic enzyme of serum; characterization, activation, and reaction with inhibitors. J. Gen. Physiol., 1945, 28: 559.
35. Christensen, L. R., and Smith, D. H. Plasminogen purification by acid extraction. Proc. Soc. Exp. Biol., N. Y., 1950, 74: 840.
36. Cliffton, E. E. Variations in proteolytic and antiproteolytic reactions of serum. J. Laborat. Clin. M., 1952, 39: 105.
37. Idem. The present status of the therapeutic use of enzymes. Am. J. M. Sc., 1954, 228: 568.
38. Cliffton, E. E., and Cannamela, D. In vivo studies of human plasmin. J. Appl. Physiol., 1953, 6: 143.
39. Connell, J. F., and Rousselot, L. M. The use of enzymatic agents in the debridement of burns and wound sloughs. Surgery, 1951, 30:43.
40. Dale, H. H., and Walpole, G. S. Some experiences on factors concerned in the formation of thrombin. Biochem. J., Lond., 1916, 10: 331.

41. Dastre, A. Fibrinolyse dans la Sang. Arch. physiol. norm. path., 1893, 5: 661.
42. Delezenne, C., and Pozerski, E. Action du serum sanquin sur la gelatine en presence du chloroform. C. rend. Soc. biol., 1903, 55: 327.
43. Demuth, F., and Riesen, I. von. Eiweisstoffwechsel normaler und bosartiger gewebe in vitro. Biochem. Zschr., 1928, 203: 22.
44. Denis, P. S. Essai sur l'application de la chimie a l'etude physiologique du sang de l'homme. 336 pp. Paris: Bechet jne., 1838.
45. Denys, J., and Marbaix, H. Les peptonisations provoquees par le chloroform. Cellule, Louvain, 1889, 5: 197.
46. Dillard, G. H. The trypsin inhibitor of the urine in health and disease. J. Laborat. Clin. M., 1950, 36: 266.
47. Duiguid, J. B. Pathogenesis of atherosclerosis. Lancet, Lond., 1949, 2: 925.
48. Idem. Diet and coronary disease. Lancet, Lond., 1954, 1: 891.
49. Idem. Mural thrombosis in arteries. Brit. M. Bull., 1955, 11:36.
50. Feissly, R. Sur les proteinase contenues dans le fraction "acidoglobulines" de divers plasmas. Schweiz med. Wschr., 1942, 72: 516.
51. Fidon, L., Gautier, C. L., and Martin, E. Recherches physiologiques sur le sang des noyes. C. rend. Soc. biol., 1908, 45: 474.
52. Fishman, J. B., and Kline, D. L. Isolation of partially purified human plasmin. Proc. Soc. Exp. Biol., N.Y., 1956, 91: 323.
53. Fletcher, A. P., and Johnson, A. J. Methods employed in the purification of streptokinase. Proc. Soc. Exp. Biol., N.Y., 1957, 94: 233.
54. Geiger, W. B. Involvement of a complement-like factor in the activation of blood protease. J. Immun., Balt., 1952, 69: 597.
55. Goldhaber, P., Cornman, I., and Ormsbee, R. A. Experimental alteration of the ability of tumor cells to lyse plasma clots in vitro. Proc. Soc. Exp. Biol., N.Y., 1947, 66: 590.
56. Gormsen, J. Leukemia, splenectomy, and fibrinolysis. Ugeskr. laeger, 1955, 117: 426.
57. Grassmann, W., and Heyde, W. Zur Kenntnis der Peptidases des Blutserums. Zschr. physiol. Chem., 1930, 188: 69.
58. Green, J. R. Note of the action of sodium chloride in dissolving fibrin. J. Physiol., 1887, 8: 372.
59. Greig, H. B. W. Inhibition of fibrinolysis by alimentary lipemia. Lancet, Lond., 1956, 271: 16.
60. Grob, D. The antiproteolytic activity of serum. 1. The nature and experimental variation of antiproteolytic activity of serum. J. Gen. Physiol., 1943, 26: 405.
61. Idem. Further studies on protein, polypeptide, and other inhibitors of serum proteinase, tyrosine, and papain. J. Gen. Physiol., 1949, 33: 103.
62. Guest, M. M., Daly, B. M., Ware, A. G., and Seegers, W. H. A study of the antifibrinolysin activity in the plasma of various animal species. J. Clin. Invest., 1948, 27: 785.
63. Idem. A study of antifibrinolysin activity in human plasma during pathological states. J. Clin. Invest., 1948, 27: 793.
64. Hahn, M. Zur Kenntnis der Wirkungen des extravascularen Blutes. Berl. klin. Wschr., 1897, 34: 499.
65. Halse, T. Fibrinolyse. Edition Cantor. Freiberg, Germany, 1948.
66. Hedin, S. G. The presence of a proteolytic enzyme in the normal serum of the ox. J. Physiol., Lond., 1903, 30: 195.
67. Hildebrandt, H. Weiteres ueber hydrolytische Fermente, deren Schicksal und Wirkungen, sowie uber Fermentfestigkeit und Hemmung der Fermentationen im organismus. Virchow's Arch., 1893, 131: 5.
68. Hunter, J. A Treatise on the Blood, 1794. London, 1812.
69. Imperati, L. La fibrinolisi post operatoria. Riforma med., 1937, 53: 1694.
70. Innerfield, I., Shub, H., and Boyd, L. J. Buccally administered streptokinase. N. England J. M., 1958, 258: 1069.
71. Jacobsson, K. Electrophoretic demonstration of two trypsin inhibitors in human blood serum. Scand. J. Clin. Lab. Invest., 1953, 5: 97.
72. Idem. Studies on the trypsin and plasmin inhibitors in human blood serum. Scand. J. Clin. Lab. Invest., 1955, Supp. 14, 7: 57.
73. Johnson, A. J., Fletcher, A. P., McCarty, W. R., and Tillet, W. S. Effects in patients of intravenous infusions of purified streptokinase preparations. Proc. Soc. Exp. Biol., N.Y., 1957, 94: 254.
74. Johnson, S. A., and Schneider, C. L. The existence of antifibrinolytic activity in platelets. Science, 1953, 117: 229.
75. Kaplan, M. H. The nature and the role of the lytic factor in hemolytic streptococcal fibrinolysin. Proc. Soc. Exp. Biol., N.Y., 1944, 57: 40.
76. Keys, A. The diet and the development of coronary artery disease. J. Chronic Dis., 1956, 4: 364.
77. Idem. Diet and the epidemiology of coronary artery disease. J. Am. M. Ass., 1957, 164: 1912.
78. Kline, D. L. Purification and crystallization of plasminogen. J. Biol. Chem., 1953, 204: 949.
79. Kolmen, S. N., Guest, M. M., and Celander, D. R. Evidence for the absorption and protection of urokinase by washed human red blood cells. Federation Proc., Balt., 1957, 16: 205.
80. Kunitz, M. Crystalline soybean trypsin inhibitor. J. Gen. Physiol., 1946, 30: 291.
81. Idem. Crystalline soybean trypsin inhibitor: II. General properties. J. Gen. Physiol., 1947, 30: 291.
82. Laki, K. The transition of fibrinogen to fibrin. Tr. 4th Conf., Blood Clotting and Allied Problems. Josiah Macy, Jr. Found., 1951, p. 217.
83. Landsteiner, K. Zur Kenntnis der antifermentiven, lytischen und agglutinierenden Wirkungen des Blutserums und der Lymphe. Zbl. Bakt., 1900, 27: 357.
84. Lassen, M. Heat denaturation of plasminogen in the fibrin plate method. Acta physiol. scand., 1952, 27: 371.
85. Lewis, J. H., and Ferguson, J. H. Studies on a proteolytic enzyme system of blood: I. Inhibition of fibrinolysin. J. Clin. Invest., 1950, 29: 486.
86. Idem. Studies on a proteolytic enzyme system of the blood: II. Fibrinolysokinase activators for profibrinolysin. J. Clin. Invest., 1950, 29: 1059.
87. Idem. A proteolytic enzyme system of the blood: III. Activation of dog serum profibrinolysin by staphylokinase. Am. J. Physiol., 1951, 166: 594.
88. Lombardo, L. J. Studies in the prevention of fibrinolysis occurring in prostatic surgery. Tr. West. Sect. Am. Urol. Ass., 1957, 24: 83.
89. Loomis, E. Fibrinolysin: Nomenclature, unit, assay, preparation and properties. Arch. Biochem., N.Y., 1947, 12: 1.
90. Idem. Fibrinolysin and antifibrinolysin: A proteolytic enzyme in blood. Tr. 5th Conf., Blood Clotting and Allied Problems. Josiah Macy, Jr. Found., 1952, p. 280.

91. Loomis, E. C., Ryder, A., and George, C. Isolation and purification of antifibrinolysin. Arch. Biochem., N.Y., 1949, 20: 444.
92. Macfarlane, R. G. Fibrinolysis following operation. Lancet, Lond., 1937, 1: 10.
93. Macfarlane, R. G., and Biggs, R. Observations on fibrinolysis: spontaneous activity associated with surgical operations, trauma, etc. Lancet, Lond., 1946, 2: 862.
94. Macfarlane, R. G., and Pilling, J. Fibrinolytic activity of normal urine. Nature, Lond., 1947, 159: 779.
95. Idem. Observations on fibrinolysis: plasminogen, plasmin, and antiplasmin content of human blood. Lancet, Lond., 1946, 2: 562.
96. Madden, J. F., and Ravits, H. G. Enzyme debridement of indolent infected cutaneous ulcers. J. Am. M. Ass., 1952, 149: 1616.
97. Margulis, R. R., and Brush, B. E. The use of fibrinolysin in surgical complications. Arch. Surg., 1952, 65: 511.
98. McCarty, W. R., and Tillet, W. S. Streptokinase-streptodornase in chronic infections of foot involving bones and joints. Surg. Clin. N. Am., 1952, 32: 405.
99. McVay, L. V., and Sprunt, D. H. Streptokinase and streptodornase in the treatment of diabetic gangrene. Arch. Int. Med., 1951, 87: 551.
100. Mendes Fagundes, J. J. The effect of toluidine blue on blood coagulation. Gaz. med. Port., 1954, 7: 442.
101. Meyers, W. M., Burdon, K. L., and Riley, M. N. Proteolytic activity of whole human serum following surgery. J. Laborat. Clin. M., 1957, 49: 377.
102. Miller, J. M. The anti-inflammatory effect of intramuscular streptokinase. Ann. N. York Acad. Sc., 1957, 68: 185.
103. Miller, J. M., Godfrey, G. C., Ginsberg, M., and Papastrat, C. J. Clinical experiences with streptokinase administered buccally. J. Am. M. Ass., 1958, 166: 478.
104. Milstone, H. A factor in normal blood which participates in streptococcal fibrinolysis. J. Immun., Balt., 1941, 42: 109.
105. Mole, R. H. Fibrinolysin and the fluidity of the blood postmortem. J. Path. & Bact., Lond., 1948, 60: 413.
106. Morgagni, J. B. The Seats and Causes of Diseases. V. 3, Book 4. London, 1769.
107. Morowitz, P. Uber einige postmortale Blutveranderungen. Beitr. chem. Phys. Path., 1906, 8: 1.
108. Moser, K. M. Thrombolysis with fibrinolysin (plasmin), new therapeutic approach to thromboembolism. J. Am. M. Ass., 1958, 167: 1695.
109. Mullertz, S. A plasminogen activator in spontaneously active human blood. Proc. Soc. Exp. Biol., N.Y., 1953, 82: 291.
110. Mullertz, S., and Lassen, M. The activator system in blood indispensable for formation of plasmin by streptokinase. Proc. Soc. Exp. Biol., N.Y., 1953, 82: 264.
111. Nolf, P. Des modifications de la coagulation du sang chez le chien apres extirpation du foie. Arch. internat. physiol., Liége, 1905, 3: 1.
112. Opie, E. L., and Barker, B. I. Leucoprotease and antileucoprotease in mammals and birds. J. Exp. M., 1907, 9: 207.
113. Peacock, A. C., and Sheehy, J. J. Studies of various tests for malignant neoplastic diseases. VII. Serum inhibitors of chymotrypsin and trypsin. J. Nat. Cancer Inst., 1952, 12: 861.
114. Remmert, L. F., and Cohen, P. P. The partial purification and preparation of a proteolytic enzyme of the human serum. J. Biol. Chem., 1949, 181: 431.
115. Rocha e Silva, M., Andrade, S. O., and Teixeira, R. M. Fibrinolysis in peptone and anaphylactic shock in the dog. Nature, Lond., 1946, 157: 801.
116. Rosenmann, M. Uber Fibrinolyse. III Mitteilung. Biochem. Zschr., 1936, 287: 26.
117. Sahli, W. Ueber das Vorkommen von Pepsin und Trypsin im normalen menschlichen Harn. Pflügers Arch., 1885, 36: 209.
118. Scott, E. V. Z., Matthews, W. F., Butterworth, C. E., and Frommeyer, W. B. Abnormal plasma proteolytic activity. Surg. Gyn. Obst., 1954, 99: 679.
119. Selye, H. The general adaptation syndrome and the diseases of adaptation. J. Clin. Endocr., 1946, 6: 117.
120. Sgouris, J. T., McCall, K. B., and Inman, J. K. Preparation and activation of human plasminogen. Fed., Proc., Balt., 1957, 16: 335.
121. Sherry, S. The participation of fibrin in the activation of the fibrinolytic enzyme of plasma. J. Clin. Invest., 1954, 33: 966.
122. Idem. Fibrinolytic activity of streptokinase activated human plasmin. J. Clin. Invest., 1954, 33: 1054.
123. Sherry, S., Calloway, D. W., and Freiberg, R. The prevention of postoperative adhesions in the dog by means of intravenous injections of plasminogen activators. Proc. Soc. Exp. Biol., N.Y., 1955, 90: 1.
124. Sherry, S., Titchener, A., Gottesman, L., Wasserman, P., and Troll, W. The enzymatic dissolution of experimental arterial thrombi in the dog by trypsin, chymotrypsin, and plasminogen activators. J. Clin. Invest., 1954, 33: 1303.
125. Shulman, N. R. The inhibition of proteolytic enzymes by serum. J. Exp. M., 1952, 95: 571.
126. Shulman, N. R., and Tagnon, H. S. Estimation of plasmin activity by radioactive measurement. J. Biol. Chem., 1950, 186: 69.
127. Soicher, R. R., Richards, P., and Bram, R. The estimation of profibrinolysin. J. Laborat. Clin. M., 1954, 43: 495.
128. Spier, I. R., Reese, T., and Cliffton, E. E. Treatment of infected wounds and chronic sinus tracts with enzymes, plasmin, hyaluronidase and antibiotics. Am. J. Surg., 1956, 92: 496.
129. Stefanini, M., and Dameshek, W. The Hemorrhagic Disorders. New York: Grune and Stratton, 1955.
130. Stefanini, M., and Murphy, I. S. Studies in platelets, XIV. Human platelets as source of antifibrinolysin. J. Clin. Invest., 1956, 35: 355.
131. Storm, O. Fibrinolytic activity in human tears. Scand. J. Clin. Lab. Invest., 1955, 7: 55.
132. Sussman, B. J., and Fitch, T. S. P. Thrombolysis with fibrinolysin in cerebral arterial occlusion. J. Am. M. Ass., 1958, 167: 1705.
133. Tagnon, H. J., Levenson, S. M., Davidson, C. S., and Taylor, F. H. The occurrence of fibrinolysis in shock, with observations on the prothrombin time and the plasma fibrinogen during hemorrhagic shock. Am. J. M. Sc., 1946, 211: 88.
134. Tagnon, H. J., and Palade, G. E. Activation of proplasmin by a factor from mammalian tissue. J. Clin. Invest., 1950, 29: 317.
135. Tagnon, H. J., and Peterman, M. L. Activation of proplasmin by a tissue fraction. Proc. Soc. Exp. Biol., N.Y., 1949, 70: 359.

136. TAGNON, H. J., SCHULMAN, P., WHITMORE, W. F., and KRAVITZ, S. C. The hemorrhagic syndrome of metastatic prostatic cancer and its treatment. J. Clin. Invest., 1952, 31: 666.
137. TAGNON, H. J., WHITMORE, W. F., SCHULMAN, P., and KRAVITZ, S. C. Significance of fibrinolysis occurring in patients with metastatic carcinoma of the prostate. Cancer, 1953, 6: 63.
138. TEALE, F. H., and BACH, E. The nature of serum antitrypsin and its relation to autolysis and the formation of toxins in infections and anaphylaxis. Proc. Roy. Soc. Med., Lond., 1919, 13: 15.
139. TEITELMAN, S. L., MOVITZ, D., and ZIMMERMAN, L. M. Enzymatic debridement of necrotic surfaces. Ann. Surg., 1952, 136: 267.
140. TILLET, W. S. Streptokinase-streptodornase. Symposium on burns. Nat. Res. Council, 1951, p. 155.
141. TILLET, W. S., and GARNER, R. L. The fibrinolytic activity of hemolytic streptococci. J. Exp. M., 1933, 58: 485.
142. TILLET, W. S., JOHNSON, A. J., and MCCARTY, W. R. The intravenous infusion of streptococcal fibrinolytic principle (streptokinase) into patients. J. Clin. Invest., 1955, 34: 169.
143. TILLET, W. S., and SHERRY, S. The effect in patients of streptococcal fibrinolysin (streptokinase) and streptococcal desoxyribonuclease on fibrinous, purulent, and sanguinous pleural effusions. J. Clin. Invest., 1949, 28: 173.
144. TILLET, W. S., SHERRY, S., CHRISTENSEN, L. R., JOHNSON, A. J., and HAZELHURST, G. Streptococcal enzymatic debridement. Ann. Surg., 1958, 131: 12.
145. TROLL, W., and SHERRY, S. The activation of human plasminogen by streptokinase. J. Biol. Chem., 1955, 213: 881.
146. TROLL, W., SHERRY, S., and WACHMAN, J. The action of plasmin on synthetic substrates. J. Biol. Chem., 1954, 208: 85.
147. UNGAR, G. The endocrine functions of the spleen and its participation in pituitary adrenal responses to stress. Endocrinology, 1945, 37: 329.
148. UNGAR, G., and DAMGAARD, E. Studies on fibrinolytic-antifibrinolytic system in serum: I. Action of the anterior pituitary, adrenal cortex, and spleen. J. Exp. M., 1951, 93: 89.
149. UNGAR, G., DAMGAARD, E., and HUMMEL, F. P. The fibrinolysin-antifibrinolysin system in serum: mechanism of its endocrine control. Endocrinology, 1951, 49: 805.
150. VON KAULLA, K. N. Betrachtungen zur postnarkotischen Fibrinolyse. Schweiz med. Wschr., 1947, 77: 313.
151. VON KAULLA, K. N., and WEINER, M. New instrument for study of clotting and fibrinolysis. Fed. Proc., 1953, 12: 149.
152. Idem. Studies on coagulation and fibrinolysis by a new technique of continuous recording. Blood, N.Y., 1955, 10: 362.
153. WASSERMANN, A. E., CIMINERA, J. L., HAYFLICK, L., and VERWEY, W. F. Quantitative determination of streptokinase. J. Laborat. Clin. M., 1953, 41: 812.
154. WILLIAMS, J. R. The fibrinolytic activity of urine. Brit. J. Exp. Path., 1951, 32: 530.
155. WINTROBE, M. M. Clinical Hematology, Ed. 4, p. 286. Philadelphia: Lea and Febiger, 1956.
156. YAMAKAWA, S. The autodigestion of normal serum through the action of certain chemical agents. J. Exp. M., 1918, 27: 689.
157. ZIMMERMAN. As cited by Macfarlane, R. G., and Biggs, R. Fibrinolysis, its mechanism and significance. Blood, N.Y., 1948, 3: 1167.

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

The Use of Cadaver Cartilage Homografts in Reconstructive Facial Surgery (Les homogreffes de cartilage en chirurgie faciale reconstructive). J. L. GRIGNON. *Ann. chir. plast.*, Par., 1958, 3: 207.

SINCE the studies of Paul Ber (1865), Ollier (1867), Koenig (1896), and Von Mangoldt (1899) cartilage grafting has been practiced clinically and has given both gratifying and disappointing results. In the author's experience the clinical application of cartilage grafting was rather successful. Fresh homografts were considered as useful as autografts, but because of the difficulty of procuring them the author resorted in many cases to the use of cartilage homografts from cadavers obtained at 6 to 10 hours after death.

In cartilage grafting different factors come into play. Donors should be less than 35 years of age as materials from older individuals may show calcific foci; persons with malignant blood dyscrasias, pulmonary tuberculosis, and asthma should be excluded.

After transplantation the histologically different cartilage types behave similarly and the recipient site requirement dictates the type of cartilage to be used. Different anatomical sites seem to influence the take of a grafted cartilage. Heavily scarred areas are unfavorable sites because of a poor nutritional environment, but richly vascularized tissues favor graft absorption. The perichondrium should be preserved as it is of nutritional value to the grafted cartilage and also seems to exhibit a protective barrier to resorption. The type of graft is the decisive factor responsible for resorptive processes. Autografts and fresh homografts will show the least change, whereas heterografts will almost constantly be invaded by fibrous tissue. Cellular infiltrations, erosions, lysis of cartilage by fibrous tissue, and chondrocytolysis are characteristic. Some absorption is of no consequence as long as the graft is thick enough for some cartilage tissue to persist. Heterografts show irreversible processes and total absorption. Mucoproteins and mucopolysaccharides of the cartilage seem to protect against the destructive antigen-antibody reactions.

The homologous cartilage cadaver grafts that were used by the author were preserved in an aqueous suspension of tifomycin and stored at temperatures of −40 degrees C. Cartilage thus treated was applied in 9 patients; 11 patients had autografts. No early or late processes indicating resorption were seen. If further clinical and experimental data support these conclusions, cadaver cartilage banks should be established.

—Karel B. Absolon, M.D.

EYE

Intraocular Foreign Body. W. J. LEVY. *Brit. J. Ophth.*, 1958, 42: 610.

THIS IS a report on 272 patients with intraocular foreign bodies who were admitted to the Moorfields Eye Hospital from 1946 to 1955, and followed up for at least 3 years.

In 171 cases the anterior route was used in removing the foreign body, and in 63 cases the posterior route. The operative technique is given for both methods.

The results of the study showed that the anterior route was preferred and the results, visually, were better. The incidence of infection was noticeably low. Frank infection or persistent severe uveitis is still the most important reason for the removal of an eye.

—Earl H. Merz, M.D.

Calcium Oxalate Crystals Within Ocular Tissues. LORENZ E. ZIMMERMAN and FRANK B. JOHNSON. *Arch. Ophth.*, Chic., 1958, 60: 372.

INDEPENDENTLY AND WITHOUT KNOWLEDGE of the investigations of Cogan *et al.*, the authors discovered birefringent crystals of calcium oxalate in the lens nuclei of aged patients with morgagnian cataracts and in young persons with long-standing retinal detachments usually initiated by penetrating injuries.

The methods of identification included histochemistry, electron and x-ray diffraction, and the use of polarized light.

The oxalate is believed to be formed in situ and deposited within a preformed mucoproteinaceous matrix.

The significance of the findings is not known.

—J. Winston Duggan, M.D.

Denervation of the Lacrimal Gland. JOHN WHITWELL. *Brit. J. Ophth.* 1958, 42: 518.

IN CASES OF EPIPHORA in which the lacrimal sac is absent or severely damaged, or the puncta or canaliculi are absent or strictured, restoration of a passage from the conjunctival sac to the nose is extremely difficult and treatment by diminishing the secretion of tears is recommended.

Epiphora is due to reflex excess lacrimation, and an operation designed to abolish the reflex lacrimal secretion by cutting the lacrimal branch of the zygomatic nerve as it enters the lacrimal gland is presented in detail.

The results of denervation of the lacrimal gland by cutting the secretomotor supply to the gland in 6 cases are discussed. In 4 cases there was considerable decrease in the epiphora. There were no important complications. —*J. Jack Stokes, M.D.*

Reconstruction of the Nasolacrimal Passage with Thiersch's Skin Graft. A Preliminary Report. CHU CH'UNG-SHENG. *Chin. M. J.*, 1958, 76: 568.

A METHOD OF RECONSTRUCTION of a passage from the conjunctival sac to the nasal cavity with skin is described. The indications and contraindications are discussed. The operation is used chiefly in cases in which the lacrimal sac is missing or has been almost completely destroyed. The operative technique, which consists chiefly of the insertion of a tube of skin from the conjunctiva to the nose, is described in detail. The results in 7 cases are reported.

—*J. Jack Stokes, M.D.*

The Chamber Angle in Glaucoma. A. L. KORNZWEIG, M. FELDSTEIN, and J. SCHNEIDER. *Am. J. Ophth.*, 1958, 46: 311.

SURPRISINGLY ENOUGH, not too much is known about the pathology of the drainage system centering around the angle of the anterior chamber in primary glaucoma. Most reports have been based on studies of pathologic material, either postoperative or in absolute glaucoma, in which widespread atrophic and degenerative changes have occurred.

The authors were able to obtain 11 eyes from 7 patients—eyes which had been affected by chronic simple glaucoma and acute episodes of congestive glaucoma, but none of which had suffered surgical intervention.

In all eyes but one, the angles of the anterior chamber were open. The trabeculae of all the sections showed varying degrees of thickening and sclerosis with corresponding narrowing and obliteration of the intertrabecular spaces. Pigment granules and cells were present to some extent in all eyes, scattered throughout the trabeculae. Schlemm's canal showed various degrees of patency, from normal to almost complete occlusion. When occluded, the cause seemed to be endothelial proliferation or compression by thickened or degenerated trabeculae.

All these factors, by narrowing or occluding the outflow channels, contribute to the increased intraocular pressure of primary wide angle glaucoma.

—*J. Winston Duggan, M.D.*

Recovery of Toxoplasma from a Human Eye. MICHAEL J. HOGAN, PHYLLIS A. SWEIGART, and ANN LEWIS. *Arch. Ophth.*, Chic., 1958, 60: 548.

IN THIS article the authors report the Toxoplasma organism recovered from the enucleated eye of a 20 year old youth. A diagnosis of congenital ocular toxoplasmosis was made 8 years previously.

The clinical and microscopic studies are described in detail. The cultural studies were performed on mice. The chorioretinal tissues from the back of the eye was ground in a mortar and injected intraperitoneally into 4 mice. Two of the mice were also given intracerebral injections. In 3 weeks the brains were removed, ground, and the material injected into 4 other mice. This procedure was repeated again and finally organisms were isolated from the peritoneal fluid.

These studies are of great interest because it is thought that some cases of inapparent congenital toxoplasmosis, with late exacerbations, are caused by Toxoplasma strains of low virulence. The disease is unrecognized until a late flare-up occurs.

—*Earl H. Merz, M.D.*

Ocular Toxoplasmosis. MICHAEL J. HOGAN. *Am. J. Ophth.*, 1958, 46: 467.

THIS IS a review of the entire subject of toxoplasmosis starting with the animal infections, then dealing with the human infections. The symptoms, biology, epidemiology, tests, and pathology are all reviewed.

Thirty-six cases of congenital ocular toxoplasmosis are reported. In 20 per cent of the cases there was evidence of cerebral calcification which could be considered toxoplasmic. In 30 per cent of the cases there was monocular involvement. Thirty-three per cent of the cases had a late relapse of the congenital infection.

Laboratory examination revealed that 9 of the patients had positive dye tests and negative skin tests. These results show that the dye test is more reliable than the skin test. The dye test on patients with uveitis showed 35 per cent of the sera to be positive to Toxoplasma in a titer of 1:16 or higher.

Clinically, ocular inflammation rarely occurs during the course of acute postnatally acquired systemic toxoplasmosis, although some cases have been reported. The treatment with daraprim and sulfadiazine in acquired ocular toxoplasmosis was found to be disappointing, but further studies seem to be warranted.

—*Earl H. Merz, M.D.*

Sensitivity of Micro-Organisms in Conjunctivitis to Sulfonamides and Antibiotics. C. B. DHURANDHAR, D. G. MOODY, and J. S. SAROYA, *J. Postgrad. M.*, Bombay, 1958, 4: 124.

THE GREAT VERSATILITY of bacterial metabolism and the current large scale, often indiscriminate, use of antibiotics has resulted in the emergence of resistant strains which baffle the clinician in his practice. This study was undertaken in the ophthalmic department of the K.E.M. Hospital, Bombay, to find out the organisms in ocular infections which have become resistant to particular antibiotics and to find out the antibiotics of choice in particular infections and thus to help the busy clinicians in crowded out-patient departments to prescribe even in the absence of a detailed bacteriological study, from clinical observations only.

The strains for this study were isolated from cases of conjunctivitis and trachoma. Cultures were made from the conjunctival sac of the lower fornix and detailed cytologic study was done in each case by staining the smears from the conjunctival discharge and epithelial scrapings with the Giemsa technique.

Sensitivity tests of sulfonamides and the following antibiotics were carried out: penicillin, streptomycin, chloramphenicol, aureomycin hydrochloride, terramycin hydrochloride, neomycin, achromycin, and aureomycin.

The authors concluded that staphylococci are the most common bacterial cause of conjunctivitis and that they are most sensitive to chloromycetin and neomycin, and least sensitive to penicillin, sulfanilamide, and sulfacetamide. It was further concluded that, while detailed bacteriologic examination in a minor ocular affection, such as conjunctivitis, is the counsel of perfection, it is not a practical possibility. Accordingly, it is advocated that sensitivity tests be done in clinically resistant cases and in intraocular infections, and that such cases be treated as indicated by these tests. —*A. V. Mortensen, M.D.*

Penetrating Keratoplasty. BRENDAN D. LEAHEY. *Am. J. Ophth.*, 1958, 46: 541.

THE AUTHOR summarizes in considerable detail experiences gained in corneal transplant work over the past 19 years in 148 cases. A statistical analysis of 100 consecutive transplants done during the years 1944 to 1954 is included.

The following recent improvements in technique and therapy are stressed.

1. Preoperative preparation for grafting by elimination of blood vessels by radiation, superficial keratectomy, and conjunctival recession.

2. Improvements in fixation of the graft, in which two original track suture techniques and several new instruments are described in detail.

3. Prevention of anterior synechias by the use of air in the anterior chamber and, to a lesser extent, by improvements in suturing.

4. Use of steroids, topically and orally, to combat edema and inflammation.

5. Prevention of vascularization in a new graft by the use of beta radiation, specifically by use of the 23 mc. radium D. applicator.

The author favors a 5 mm. graft cut with a hand trephine and held in place by overlying sutures plus two direct sutures.

Among complications, glaucoma was the most frequent, occurring in about one-third of the cases. Anterior synechia occurred in about 23 per cent of the recent cases. Edema of the cornea and proliferation of connective tissue on the back of the graft were also major complications. Infection and traumatic cataract were rare.

In considering results in the 100 consecutive grafts, the author felt that 69 per cent were improved, 19 per cent unchanged, and 12 per cent worse. This was further analyzed into the most favorable cases, such as keratoconus, nodular dystrophy, and lattice keratitis, which showed 86.5 per cent improvement. In cases of interstitial keratitis, 63 per cent were improved. In disciform and dendritic keratitis, 69 per cent were improved. Leucomas, from pyogenic ulcers, showed 45 per cent improvement and chemical burns were 60 per cent improved. In 4 cases of marked corneal edema, secondary to corneal scarring and endothelial dystrophy, the end result was complete failure.

—*A. V. Mortensen, M.D.*

Replacement of Traumatic Iris Prolapse. R. STEIN. *Brit. J. Ophth.*, 1958, 42: 407.

IN THIS ARTICLE the author reports on 42 cases of ocular injury with iris prolapse. If the prolapse is not too large and surgery is to be performed within 4 days, and provided that the iris is not too severely lacerated, the author suggests replacement of the iris instead of excision of the prolapsed iris. This procedure eliminates the defect in the iris, the photophobia, and the dazzling usually seen.

The technique used is to make an incision at the limbus, insert a spatula through the opening, and sweep the iris out of the corneal wound and reposit it in normal position. Air is then injected into the anterior chamber and the wound is sutured tightly or a conjunctival flap is used to cover the wound. Antibiotics and steroids prevent secondary infection.

The corneal sutures are placed after the iris has been removed from the corneal wound.

—*Earl H. Merz, M.D.*

Experimental Electrochemical Removal of Copper Splinters from the Isolated Vitreous. T. KRAWAWICZ and K. ZAGORSKI. *Brit. J. Ophth.*, 1958, 42: 494.

THE MECHANICAL REMOVAL of intraocular nonmagnetic foreign bodies with endoscopic devices is frequently unsatisfactory. Numerous methods of noninstrumental removal of copper from the eye have been devised, but all have been failures in clinical application.

The authors devised a method of removing copper from isolated bovine vitreous electrochemically. Copper splinters were placed in fresh vitreous and the anode was placed in contact with the copper splinters. The cathode was placed 15 to 20 mm. away. Dissolution of the copper occurred at the anode and reversal of the current caused deposition of the copper on the cathode. Up to 79 per cent of the copper which dissolved in the vitreous could be removed by means of cathodic deposition. —*J. Jack Stokes, M.D.*

Familial Electroretinographic and Adaptometric Studies in Retinitis Pigmentosa. GEORGE GOODMAN and RALPH D. GUNKEL. *Am. J. Ophth.*, 1958, 58: 142.

THIS INVESTIGATION developed as part of an interest in the evaluation of rod and cone function in retinal heredodegenerative diseases and the application of this knowledge to clinical and genetic problems. Batteries of tests were used to survey photopic-scotopic relationships in different areas of visual function. Investigation of the affected and normal kin in 2 families with dominant retinitis pigmentosa was attempted on a limited scale.

Visual function was studied in 13 members of these 2 families who ranged in age from 16 months to 64 years. Electroretinograms were obtained from all subjects, and adaptometry, perimetric light-sense testing, and visual field examinations were completed in those who were more than 5 years of age.

A scotopic defect, with an intact photopic response, was elicited in younger affected members. There was a progressive deterioration of photopic and scotopic function with advancing age. A significant clinical finding was the presence of depressed scotopic electroretinograms in 4 children less than 10 years of age who showed no pathologic alteration of the fundus.

The electroretinogram was extinguished only in the 64 year old subject. This finding was in contrast to previous reports of absent responses in the majority of patients with retinitis pigmentosa.

The physiologic, clinical, and genetic implications of the study are discussed in detail.

—*A. V. Mortensen, M.D.*

Calcium Oxalate and Calcium Phosphate Crystals in Detached Retinas. David G. Cogan, Toichiro Kuwabara, Jermiah Silbert, Harold Kern, and Others. *Arch. Ophth.*, Chic., 1958, 60: 366.

Oxalate salts occur rarely in the human body. They have been reported in the colloid of the normal thyroid and in various tissues, particularly the kidney tubules, after ingestion of large and lethal amounts of oxalic acid. The authors have noted crystals of this nature occasionally in detached retinas and cataractous lenses.

In 2 cases, crystals were found situated in the outer layers of the retina, in close relation to the rods and cones. Histochemical tests and x-ray diffraction proved the crystals to be monohydrated calcium oxalate and calcium phosphate.

The metabolic significance of these crystals is totally obscure. —*J. Winston Duggan, M.D.*

EAR

The Problem of Sudden Deafness (Das Problem der ploetzlich auftretenden Taubheit). G. v. Schulthess. *Schweiz. med. Wschr.*, 1958, 88: 845.

The author, of the Otorhinolaryngological Department of the University of Zurich, Switzerland, discusses the etiology and pathogenesis of sudden unilateral deafness. Cases of deafness due to injury (fracture of the petrous bone), to bacterial infections, to drug toxicity (streptomycin, quinine, salicylates), as well as to intracranial processes, are not included.

Sudden deafness is nearly always unilateral. Three groups of processes are differentiated in discussing the pathogenesis: (1) deafness due to neuritis of the acoustic nerve of toxic-microbial origin; (2) "vascular accidents" (Lindsay); (3) sudden deafness due to dysfunction of the autonomic nervous system.

The site of the disturbance may be either the organ of Corti, or the first neuron of the eighth nerve, or the primary nuclei of the acoustic nerve. It cannot be assumed that the cause of unilateral deafness could be located more centrally because the cerebral fibers divide and cross at several levels proximally from the primary nuclei. All unilateral hearing disturbances can be combined with vestibular symptoms, analogous to the conditions in Meniere's disease.

Sudden unilateral deafness is most frequently caused by the mumps virus. The deafness may occur with or without clinical signs of parotitis. It is assumed that neuritis of the eighth nerve or encephalitis is the underlying process. The prognosis is poor, but recovery of hearing has been observed occasionally. Also other viral infections (influenza, measles, varicella, poliomyelitis), as well as rheumatic or allergic factors, have been accused as the cause of neuritic sudden deafness. Herpes zoster of the ear seems to play a special role in this respect.

Vascular accidents on the basis of arteriosclerosis, Buerger's disease, periarteritis, thrombosis, or embolism occur only rarely but a number of cases are on record in the literature and present in the author's own experience. The involved vessels are the vestibular and cochlear arteries and the internal auditory artery. In one case, reported by Lindsay, the autopsy revealed varicosities in the area of the internal auditory canal, especially around the vestibular ganglion with degeneration of the nerve fibers of the vestibular portion of the eighth nerve.

The third group of cases of sudden deafness consists of functional disturbances of the autonomic nervous system. The most frequent is Meniere's disease, which is due to a hydrops of the endolymphatic system caused by disturbance of the secretion and absorption in the inner ear. The Barre-Lieau syndrome should also be considered; it is due to spondylotic disturbances of the cervical vertebrae and irritation of the sympathetic plexus in the area of the vertebral artery. This deafness can be improved by vasodilating drugs.

It should be emphasized that a considerable proportion of cases of sudden deafness remain unexplained as to their etiology.

The therapy depends on the underlying cause. In inflammatory and toxic conditions cortisone should be tried. In addition, hypertonic calcium injections and vitamins A, B, and E have been applied. The success is open to doubt. —*Werner M. Solmitz, M.D.*

Operations on the Middle Ear and Mastoid. O. Erik Hallberg. *California M.*, 1958, 89: 101.

In the operative treatment of suppurative diseases of the middle ear and mastoid the emphasis on the functional result to the hearing has increased greatly. Before the introduction of the sulfonamides and the antibiotics, more than half of the patients with chronic suppurative infections of the ear who were seen in the operating room had widespread destruction of the tympanic membrane with pronounced disease or scarring of the mucosa of the middle ear and cholesteatoma involving the attic, antrum, and mastoid. Little or no attention was paid to preservation of hearing, and radical mastoidectomy was the operation of choice. Lately, however, this condition is rarely seen, and the majority of patients have superior or posterior perforations leading into the attic, or mastoid antrum, or both.

From 1953 through 1957 a total of 373 patients were operated on for chronic mastoid disease at the Mayo Clinic. Postauricular incisions were used entirely for operations on the middle ear and mastoid until about 1940, but since the advent of the fenestration operation Lempert's endaural incision has been replacing the postauricular incision. As a rule, both the postauricular and the endauricular incisions render the operative field equally accessible. The endaural incision, however, allows easier removal of packs and facilitates cleaning and ventilation. This incision also makes the middle ear more accessible.

At one time it was thought that the matrix of the cholesteatoma would form an excellent epithelial lining for the radical cavity, and an effort was made to preserve it. However, in some cases the cholesteatoma rapidly formed again and frequent removal

was necessary. During the last 10 years, it has been the practice at the Mayo Clinic to remove all vestiges of cholesteatoma.

Before 1940, mastoid operations at the clinic were always done with hammer, chisel, and curet. Since the advent of the electric bur, this instrument is used almost entirely. The new fast burs are safe and easy to manipulate. A magnifying glass or microscope, or both, are always used in operations on the middle ear. As a rule, the removal of the incus and head and neck of the malleus does not result in further deterioration of the hearing, presumably because the ossicular chain had already been interrupted before the operation and had not been transmitting sound.

It is not necessary to remove granulation tissue completely from the middle ear, since it has a tendency to shrink when the cause is removed.

At the clinic, even though the incus and head and neck of the malleus were often imbedded in the cholesteatoma, if the ossicular chain seemed intact and no pathologic changes were present in the ossicles themselves, they were left intact.

If most of the drumhead and malleus were badly diseased or destroyed, the mucous membranes over the upper part of the promontory were either removed or, if possible, turned over. A free skin graft taken from behind the ear, forearm, or the abdominal wall was then applied, in an attempt to maintain communication of the eustachian tube with the round window. The graft was then firmly pressed up against the capitulum of the stapes. During 1956 and 1957, tympanoplasty of this type was done in 37 patients at the clinic, and generally speaking the results have been satisfactory in the improvement of hearing as well as in keeping the ear dry. The best results from tympanoplasty with intact ossicles are seen in patients when the ossicular chain is intact, not scarred down, and when the flap can be draped over the bridge, thus not impeding the mobility of the ossicles. If the membrana tensa is intact but the incus and head of the malleus have to be removed, the long handle of the malleus is partially dissected free and laid up against the capitulum of the stapes. If the long handle of the malleus also has to be removed or is not identified, the drumhead then is draped carefully over the capitulum of the stapes in an effort to obtain the so-called columella effect.

Most otologists agree now that all of the cholesteatoma has to be removed; for this reason, mastoid operations are probably done in much the same manner all over the world. However, no set pattern can be made for operations on the middle ear.

Otologists must not forget that elimination of disease is the first consideration and improvement of hearing second.

Treatment of the complications of mastoid disease has changed somewhat too. The more liberal use of antibiotics has led to a more conservative attitude. By not disturbing the defect, the hearing also has been maintained. In an effort to promote quicker healing, skin grafts have been used more and more since 1950. The split-thickness skin graft is the rule except for small grafts used in tympanoplasty when a graft with a thick center and thin edges is often taken from the forearm.

Surgery for Advanced Ear Cancer. JOHN S. LEWIS and HERBERT PARSONS. *Ann. Otol. Rhinol.*, 1958, 57: 305.

TWENTY-SEVEN CASES of advanced cancer of the ear were treated surgically by wide excision of the cancer area; 21 cases were squamous cell carcinoma; 3 were basal cell carcinoma; 2 were sarcoma; and one case was a malignant mixed tumor of the parotid gland. The primary site appeared to be in the middle ear in 12 cases; in the external ear in 12 others. One case arose in the mastoid, one in the pinna, and one from the parotid gland.

The surgical procedure recommended is an en bloc dissection of the temporal bone with the temporomandibular joint and adjacent soft tissues. A temporal craniotomy and the removal of cerebrospinal fluid make it possible to elevate the dura and brain from the petrous portion of the temporal bone. The ascending ramus of the mandible and the temporomandibular joint and the base of the zygoma are excised along with the specimen. The petrous portion of the temporal bone is fractured at the juncture of the inner and middle third. The dura, when involved, is excised and replaced by a temporal fascial graft. The operative defect is covered with a split thickness graft or a scalp pedicle flap. Complications were few. There were 3 deaths in the postoperative period.

The authors divide the cases according to whether all gross disease was removed at the time of operation. In 18 it was possible to remove all gross disease; in 9 there was residual disease at completion of the operation. Of the 18 patients in whom all gross disease was removed at the time of operation, 8 are alive and free of disease, from 1 to 5 years later. The patients in whom it was impossible to remove all disease received radiation therapy postoperatively. All of these died of the disease. —*John F. Daly, M.D.*

Common Problems of Otoplasty. MERTIN D. HATCH. *J. Internat. Coll. Surgeons*, 1958, 39: 171.

THE ESSENTIAL DEFORMITY of a lop ear is the excessive concavity caused by absence of the antihelix. The Luckett procedure attempts to reconstruct the missing antihelix by excising a crescent shaped piece of cartilage and skin; it is the basic procedure for correcting prominent ears. However, it often produces an outward tilting of the upper portion of the ear and a prominence of the lobule. The author presents modifications of the Luckett procedure which overcome these two difficulties.

The outward tilting of the upper part of the ear is prevented by carrying the basic incision in the cartilage anteriorly to beneath the fold of the helical rim. The incision then turns downward, beneath the undermined skin, in such a fashion as to divide the rim cartilage completely in an almost vertical direction. This procedure retains the smooth contour of the helical rim and permits a diminution of the temporal-helical angle, by removing a V shaped wedge of cartilage. With the upper and middle portion of the ear corrected, the lobule may appear excessively large. To correct the lobule, the posterior incision is carried beneath the lobule to separate it from the side of the face. As the lobule is placed in its correct position, its cut edge will be displaced forward over its cut facial attachment. Thus, the amount of excess lobular

tissue can be accurately judged and removed with a V shaped excision. The cartilages maintain their position without the use of buried stitches. The incision is closed with continuous nylon sutures. The cartilage is anchored loosely by two or three nylon mattress sutures tied over foam rubber bolsters.

—John F. Daly, M.D.

NOSE AND SINUSES

Reconstruction of Columella. ERNESTO F. MALBEC and ALBERTO R. BEAUX. *Brit. J. Plast. Surg.*, 1958, 11: 142.

THE COLUMELLA is constructed from a tubular flap. In females the tube is made on the inner aspect of the arm. In males it is constructed in the nasolabial crease. Several weeks after the tube is fashioned one end is attached at the tip of the nose. Several weeks later the other end is attached at the lip.

The authors believe that the procedure described is the best one for reconstruction and results in columellas that are fleshy, well-rounded, and covered on all sides with elastic skin.

Whenever the septum has survived loss of the columella the tube flap is split lengthwise and mucosal flaps from the septum are attached to it at the time of implantation of the posterior end of the tube.

—W. C. Huffman, M.D.

PHARYNX

The Surgical Correction of Aphagia Following Bulbar Poliomyelitis. BENJAMIN BOFENKAMP. *Arch. Otolar.*, Chic., 1958, 68: 165.

PERMANENT swallowing paralysis following bulbar poliomyelitis is extremely rare. It is believed to be due to spasm of the cricopharyngeus muscle which is a result of strong sympatheticotonic contracture at the cricopharyngeus level after paralysis of the parasympathetic fibers which course in the vagus nerve. Complete removal of the muscle is necessary if active deglutition is to be resumed.

A horizontal incision is made between the thyroid and cricoid cartilages to expose the strap muscles medially and the sternocleidomastoid muscle laterally. The former muscles are retracted medially and the latter is retracted laterally to expose the attachment of the cricopharyngeus to the cricoid cartilage on one side. The larynx and pharynx are rotated medially to expose the entire cricopharyngeus muscle. With an esophagoscope in place as a transilluminator the cricopharyngeus muscle is bluntly pared away from the pharyngoesophageal mucosa and is removed in its entirety. The tight pinch-cock appearance in the cricopharyngeus area immediately disappears as can be noted through the esophagoscope.

Two cases are reported in which the patients were able to resume swallowing within a few days following surgery.

—W. C. Huffman, M.D.

NECK

A Case of Multiple Skeletal Metastases of Thyroid Origin During Pregnancy (Su di un caso di metastasi multiple dello scheletro da adenocarcinoma della tiroide in gravidenza). G. ZINELLI and G. P. JACOPOZZI. *Ateneo Parmense*, 1958, 24: 552.

THERE ARE many contradictory opinions in the literature regarding the influence of pregnancy and the puerperium on the growth of malignant tumors. The authors review some of the literature on the experimental work that has been done on this problem. The data have been somewhat contradictory. Several workers found that experimental tumors were inhibited by simultaneous pregnancy whereas others have found the contrary to be true.

A case is reported of very rapid growth of a previously slow growing lesion. The history is that of a 30 year old woman who had noticed a small mass, 1 by 2 cm., over the right clavicle 2 years prior to admission. Since this mass was slightly tender she had consulted several physicians and nothing more had been done than injection of novocain around the mass. During the 2 years that it had been present, the mass had not changed in size. At the time of examination, she was in a state of far advanced pregnancy. She related that the tumor mass had suddenly begun to increase in size and by the second month of her pregnancy had reached the size of an orange. She also noticed the onset of gradually increasing pain in the right shoulder with gradual limitation of movements of that joint. Upon physical examination, the tumor over the clavicle appeared to be firm and fixed to the deeper planes and covered by a superficial network of small veins. Roentgenograms revealed complete osteolytic destruction of the medial half of the right clavicle. There were also osteolytic processes in the right scapula, in the eighth and ninth ribs on the right side, and a small focus in the right femoral neck. Biopsy of the mass over the right clavicle revealed that it was a metastatic adenocarcinoma. The histologic appearance of the tumor was compatible with that of metastatic thyroid carcinoma.

The authors attribute the sudden wild growth of this tumor during pregnancy to the fact that normal thyroid tissue becomes hyperactive during pregnancy.

—René B. Menguy, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Angiography for Diagnosis of Intracranial Traumatic Hemorrhages (Les aspects angiographiques des épanchements intracraniens traumatiques). P. WERTHEIMER, A. LEVY, CL. LAPRAS, and G. TUSINI. *Lyon Chir.*, 1958, 54: 481.

IN ORDER to evaluate the roentgenological findings in various types of intracranial hemorrhage 60 cases studied between 1953 and 1957 were reviewed. The roentgenological technique consisted of percutaneous injection of iodinated contrast material. Two routine views were obtained, the fronto-occipital and the lateral. Occasionally rapid serial views were obtained and studied. The clinical material consisted of the following:

Subdural hematoma		34
Acute	10	
Chronic	22	
Localized on the base of the skull	2	
Extradural hematoma		12
Vertex	2	
Base	4	
Temporoparietal region	6	
Intracerebral hematoma		8
Temporal lobe	6	
Frontal lobe	2	
Mixed subdural and intracerebral hematoma		4
Chronic subdural hygroma		2

The following aspects were evaluated on the roentgen films: (1) displacement of the brain structures and its degree, (2) diameter of the vessels, (3) the position of the anterior cerebral artery in relation to the falx cerebri, and (4) the position of the intracranial part of the carotid artery and its deformation; the appearance of the sylvian vessels.

The classical roentgenographic sign of a subdural hematoma is cerebral depression as indicated by an avascular space between the tabula interna and the peripheral ramifications of the cerebral vessels.

The authors attempt to establish roentgenological findings which would enable a fairly certain differential diagnosis between the chronic and acute types of this lesion. Chronic hematoma produces a biconvex appearance of the meniscus, while an acute subdural hematoma produces a concavoconvex shape. An extradural hematoma of the cerebral convexity produces a biconvex shape similar to the chronic subdural hematoma. However, (a) the very limited extent of this lesion and (b) its much smoother borders distinguish it from a chronic subdural hematoma.

Intracerebral hematoma of the temporal region produces an elevation of the sylvian vessels and a definite avascularity of the temporal lobe with displacement of the intracranial portion of the internal carotid artery.

The frontal intracerebral hematoma produces depression of the sylvian vessels and a circumscript avascularity of the frontal area. A very distinct engagement of the anterior cerebral artery with the falx cerebri is noticed.

The subdural and extradural hematomas of the basal region are difficult to diagnose and even more difficult to differentiate. One of the more useful signs is an elevation of the sylvian artery. Its branches are displaced medially. A triangular avascular area is seen in the frontal view, indicating the lateral extension of the basal hematoma.

—*Gunars Medins, M.D.*

The Rheoencephalogram: A Valuable Aid in the Diagnosis of Acute and Chronic Subdural Hematoma (Das Rheoenzephalogramm: Ein wertvolles Hilfsmittel fuer die Diagnosestellung bei akutem und chronischem Subduralhaematom). F. L. JENKNER. *Wien. med. Wschr.*, 1958, 108: 764.

IN SEVERAL CASES the diagnosis of a subdural hematoma and the establishment of its location have proved difficult. In these cases a rheoencephalogram has been found to be very helpful. The principle of rheoencephalography is as follows: The flow of high frequency alternating current in the body changes the current-resistance with the condition of the vessels and blood flow. The part of the body to be observed is used as a variable resistance of a Wheatstone bridge. This resistance should be varied in such a manner that there will be no flow of current in the connecting parts of the bridge. Changes in resistance will effect minimal intensity of current. This current is amplified so that a rheoencephalographic curve can be obtained. The procedure is simple and can be done within about five minutes. Electrodes are placed bilaterally, parasagittally, frontally, and above the mastoid. The cable of the rheograph is connected with the electrode of the mastoid.

This method of rheoencephalography was extremely helpful in 4 cases mentioned by the author. Figure 1 shows the curve obtained from a 21 year old man, who was comatose following an injury sustained while playing football. Neurologic examination revealed

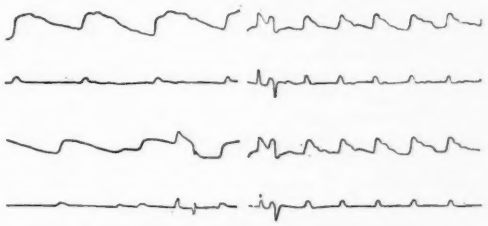


Fig. 1 (Jenkner). Curves on the left represent the findings before operation; curves on the right, those after operation. First curve, REG of the right side; second curve, differential quotient of the first curve; third curve, REG of the left side; and fourth curve, differential quotient of the third curve.

pupils equal, poor reaction to light, Babinski positive bilaterally, tendon reflexes bilaterally equally weak. Roentgenogram of the skull revealed a basal fracture. Following the rheoencephalogram the patient was operated upon and the indicated subdural hematoma on the left side was evacuated.

—*Frank Lichtenheld, M.D.*

Treatment of Severe Head Injuries. I. N. MACIVER, L. P. LASSMAN, C. W. THOMSON, and IAN MCLEOD. *Lancet*, Lond., 1958, 2: 544.

THE AUTHORS think that they have definitely reduced the mortality and morbidity rates of very severe head injuries encountered by the neurosurgical service of the Newcastle General Hospital. Their patients presented damage to the brain stem as manifested primarily by decerebrate rigidity. The difficulty of having a comparative series was recognized; however, they studied 1,092 cases of head injuries seen in 1955 and 1956 from which they were able to select 56 with either partial or complete decerebrate rigidity. This group of 56 cases was used as a control group. The treated group consisted of 26 patients from a series of 413 cases of head injuries seen since 1956.

The prognosis was best in the cases with hyperpyrexia and tonic fits superimposed on decerebrate rigidity. The prognosis was poorest in the cases with complete thermolability and absolute flaccidity. Usually there was a definite tachycardia of between 100 and 160, stertorous breathing with distended neck veins, inability to clear the nasopharnyx of secretion, vomiting, and complete coma. It is stressed that the brain stem lesion may either be produced or accentuated by supratentorial hematomas (either subdural or epidural) and that routine exploratory burr holes are usually advisable.

After the neurological and general evaluation was completed an intravenous injection consisting of 400 ml. of sterile water in triple plasma was started. When the needle was first injected blood was obtained for studies and cross-matching. Twenty-five milligrams of chlorpromazine were then injected by the drip system so as to produce relaxation. As soon as the jaw was relaxed an endotracheal tube could be inserted, after which the stomach was aspirated and warm oxygen was given. Blood was the only other fluid used in the early stages aside from the triple plasma. Until the endotracheal tube was inserted the patient was kept in a semiprone or in the Trendelenburg position—especially if there was considerable drainage into the nasopharnyx. After intubation was accomplished the patient could then be supine and was ready for surgery. A tracheotomy was usually necessary in adults. In children, however, tracheotomy is not always mandatory; it was used in 2 of 5 of the children.

The lytic cocktail usually consisted of 25 mgm. of chlorpromazine, 25 mgm. of promezathine, and 25 mgm. of pethidine combined with levallorphan. Usually from 100 to 300 mgm. were given in a period of 24 hours. The first dose could frequently be given intravenously and in almost all cases produced flaccidity and reduced the elevated temperature. It also relaxed the patient, which permitted easier intubation. relieved most of the muscle spasm and tonic fits, and protected the patient from traumatic or hemorrhagic shock. Of importance was the fact that the medication alone would tend to lower the temperature. If wet sheets and ice bags were also used, it was very easy to bring the temperature down to a normal or hypothermic degree. Gastric feedings were not permitted until the patient was past the danger of regurgitation or aspiration, a period which might last from one to 4 weeks, dependent upon the severity of the case. In the meantime the patient was given intravenous feedings made hypertonic with the addition of 50 per cent dextrose or sucrose, and, of course, initially by the use of triple strength plasma solution. Tube feedings consisted of milk and eggs in water to permit a daily caloric intake of about 2,200 calories.

Anemia developed in 10 cases. Hypopotassemia was a frequent finding but usually it was not of severe degree. The antibiotic of choice was penicillin, 1,000,000 units being given intramuscularly every 4 hours. Tetracycline was thought to be dangerous since it produced a persistent diarrhea in some of the cases.

There was a mortality rate of 36.4 per cent as compared to 69.6 per cent in the control group. Any further lowering of the mortality rate will probably depend upon better realization of the importance of respiratory insufficiency during the period of transportation to the hospital.

—*Jack I. Woolf, M.D.*

Aneurysms of the Middle Cerebral Artery. G. AF BJORKESTEN and HENRY TROUPP. *Acta chir. scand.*, 1958, 115: 153.

DURING a 20 year period, 1937–1956, 184 patients with intracranial aneurysms were admitted to the Department of Neurosurgery at the Finnish Red Cross Hospital. Of these, 52 had aneurysms of the middle cerebral artery. Thirty-five of the patients with aneurysms in the latter location were treated surgically while the remaining 17 were treated conservatively. Carotid artery ligation was not performed in any case. There were 29 men and 23 women in this group. The youngest patient at the time of first bleeding was 13, the oldest 59, and the average 38 years. Fifty-one of the 52 patients demonstrated the typical clinical manifestations of subarachnoid hemorrhage, and this was confirmed by lumbar puncture in 43. Twenty-three had focal signs, consisting of hemiplegia or hemiparesis in 22 and hemianopsia in one. In all 23 cases, the aneurysms were found on the contralateral side.

Nine of the 17 patients treated conservatively died because of the subarachnoid hemorrhages. One patient survived in a severely disabled condition for 2.5 years but with no symptoms of recurring hemorrhage and then died from an unrelated cause. Of the 7 patients living at the time of this report, 5 are severely or completely disabled, one is slightly disabled, and only one is at full working capacity.

Of the 35 who were treated surgically, 19 had only one bleeding episode prior to surgery, 8 had two, 7 had three or more, and one had chronic epilepsy. All but 3 of these patients were operated on after 2 weeks from the time of their last hemorrhage. Four patients died, a mortality of about 11 per cent.

In evaluating the results of those who were surgically treated, postoperative angiography was per-

formed on 21 of the 31 survivors. In only 11 was there no filling of the aneurysm. Of the remaining 10, there was filling of a smaller appearing aneurysm in 5 and in the other 5 the aneurysm appeared about the same.

From the clinical standpoint, no patient surviving operation has since died or has any symptoms suggesting recurrence of subarachnoid hemorrhage. Eleven are at full working capacity, 9 are slightly disabled, and 11 severely disabled. In the severely disabled group ligation or clipping of the aneurysms was performed in all cases. In 7 there was hemiparesis or hemiplegia preoperatively; in 3 more hemiplegia was noted immediately after operation and in one 15 days following surgery.

The authors believe that these results are far from satisfactory, inasmuch as only 11 of 35 surgically treated patients have regained full working capacity. It is pointed out that although the mortality in the conservatively treated group far exceeded that in the surgically treated cases, the operations in the latter group were largely performed at a time when mortality for recurrent bleeding is rather low. It is further pointed out that even though in the majority of the cases the disability in those patients who are disabled was present prior to surgery, the operation itself does bring a definite risk of increased disability. Because of this, careful judgment is necessary in the operative procedure used for occluding the aneurysm.

—*E. Thomas Boles, Jr., M.D.*

Cranioencephalic Epidermoid Cysts (Les kystes épidermoides cranio-encéphaliques). J. LEPOIRE and B. PERTUISET. *Neurochirurgia*, 1958, 1: 1.

ALTHOUGH INTRACRANIAL EPIDERMOID CYSTS are rare, their pathology and therapy are of great interest.

The capsule of the epidermoid cyst is formed by a germinative layer which in every respect resembles the malpighian epithelium of the skin. Multiplication of the cells of this layer leads to an accumulation in the center of the cyst of keratinized cellular debris, thus producing an expansion of the entire formation.

Extradural epidermoid cysts may remain within the diploe or may perforate it and extend into the epidural space, frontal sinus, orbit, or the subdural space.

Subdural epidermoids may be subdivided into retrosellar, suprasellar, and intraventricular types. Intimate relations between the capsule of the cyst and large vessels at the base of the brain may develop and interfere with complete dissection of the basilar or carotid arteries.

As to the pathogenesis of epidermoid cysts, the authors favor the epithelial theory, according to which the inclusion of epithelium is concurrent with the closure of the neural tube.

On the basis of 100 personal observations the authors describe the clinical picture of different varieties of cysts. The chiasmal location produces Olivecrona's syndrome, namely, slowly progressing primary optic atrophy with bitemporal hemianopia in a young subject; the roentgenograms show the sella turcica to be intact and one or both optic canals are widened. The infundibular variety spreads toward the third ventricle and produces characteristic endocrine and diencephalic symptoms. The encephalographic appearance of an intraventricular cyst is pathognomonic: the ventricles are displaced, deformed, or dilated, and within the intraventricular shadow there are honeycombed, interlaced, air-filled channels.

Only the extradural and intraventricular varieties can be diagnosed preoperatively on the basis of roentgenograms and encephalograms. There is no ancillary method which permits definite diagnosis in other varieties of epidermoid cysts.

The treatment is surgical removal of the cyst. In the extradural type complete excision is always possible. In other varieties a part of the capsule may have to remain if it is intimately adherent to important adjacent structures. However, the ultimate results of the operation are only slightly impaired in such cases.

—*Joseph Narat, M.D.*

Tumors of the Diencephalon and Precocious Puberty. KOZO FUKUSHIMA. *Arch. jap. Chir.*, 1958, 27: 553.

THIS REPORT from the Kyoto University Medical School includes a presentation of 3 clinical cases of tumors in the pineal region confirmed by autopsy examination, 1 case of tumor in the hypothalamic area confirmed by autopsy and a second without such confirmation, and 2 cases which might be considered borderline examples of precocious puberty, each with tumors in the hypothalamic area (1 confirmed at operation and the other by autopsy examination). Two additional cases of tumors occurring in the pineal area without evidence of precocious puberty were confirmed at autopsy.

The carefully prepared gross and histologic material, and a brief clinical resume of each case accompany the presentations, and the author incorporates a review of the literature in his discussion.

The site of the lesions produced by the tumor may be important in the etiology of precocious development. In the hypothalamus, the most severe changes observed in the confirmed cases were to be found in the pars tuberalis of the hypothalamus. Among the cases originating in the pineal region, the severest damage was found in the postventral wall of the third ventricle and less severe changes were seen in the hypothalamus. It is also to be noted, however, that the patients with tumors in the pineal area without precocious puberty also demonstrated severe change in the postventral wall of the third ventricle, although the hypothalamus was relatively free of damage. The author believes that changes in the tuber cinereum, in some particular way, play a role in the manifestation of precocious puberty.

The nuclei of the thalamus in the anterior superior portion thereof showed little change in the cases complicated by precocious puberty, while severe damage in this area was seen in patients without precocious puberty. From these observations, the author suggests a relationship between the intactness of particular thalamic nuclei and the occurrence of precocious puberty. In the midbrain, nothing definite could be discovered to suggest a possible relationship between changes in the midbrain and the process under study.

The author reviews the various cytologic characteristics of the tumors associated with precocious puberty and suggests that the teratomatous nature

and presence of the cytotrophoblast may provide secretions which result in the form of precocious puberty. The difference of incidence of precocious puberty in favor of the male may be explained on the basis of the nature of the tumor encountered.

The rate of development of the pathologic process may in some way be correlated with the development of precocious puberty. Slower, more deliberate progress of the disease is more likely to be associated with the development of this condition than is rapid destruction. This suggests that part of the clinical manifestation may be on the basis of an irritative process rather than a destructive one. —*W. Eugene Stern, M.D.*

The Surgical Treatment of Cushing's Syndrome. Frank Glenn, Richard C. Karl, and Melvin Horwith. *Ann. Surg.*, 1958, 148: 325.

The authors review the symptoms, signs, laboratory findings, and treatment in 32 patients with proved Cushing's syndrome seen over a 24 year period at the New York Hospital Cornell Medical Center. Thirty of the patients were female. They varied in age from 9 to 52 years. The most common complaint was muscular weakness or fatigue. Menstrual cycle irregularities were frequently noted. A significant emotional disturbance was present in 19 of the patients. On physical examination, a moon facies was noted in 25 patients. Truncal obesity was present in 19. Facial and body hirsutism, atrophic skin, facial plethora, acne, and increased bruisability were commonly seen. The laboratory test of most value was the determination of the serum and urinary 17-hydroxycorticoid levels. Increased 17-hydroxycorticoid values were noted in 19 of the 22 patients in whom they were determined. The urinary 17-ketosteroid levels were increased in 15 of 28 patients. The responses to corticotrophin stimulation and cortisone suppression were variable. Diabetic glucose tolerance responses, eosinopenia, leucocytosis, increased insulin resistance, lymphopenia, alkalosis, and polycythemia were common. In 10 patients renal damage ranging in extent from minimal to marked was present.

Adrenal hyperplasia was the pathological finding in 25 of the 32 patients in this series. Adrenal adenomas were present in 7. The authors point out that no satisfactory medical treatment for Cushing's syndrome is available and that radiation of the pituitary provides control of this disorder only infrequently. On the other hand, surgical removal of the hyperfunctioning adrenal cortical tissue provides remission of the disease process. In those patients who will tolerate the lateral position and in whom severe acne of the skin of the back is not present, the authors prefer to expose each adrenal gland through a lateral incision with resection of the twelfth rib. Unilateral adrenalectomy is performed at the initial operative procedure when an adenoma, or an obviously hyperplastic, or normal-appearing gland is found. An atrophic gland is left unmolested. In the patients with adrenal hyperplasia, the authors employ a two-stage bilateral total adrenalectomy unless unilateral adrenalectomy relieves the disorder. There is often a clinical remission following the excision of one adrenal gland in patients with bilateral adrenal hyperplasia. However, this is only of short duration as a rule.

In this series, there were 9 patients who underwent a unilateral adrenalectomy for either adenoma or hyperplasia. Twenty patients were totally adrenalectomized. No substitution therapy was employed preoperatively for exploration of the first adrenal gland. If an adenoma was discovered, 100 mgm. of hydrocortisone was given intravenously during surgery, followed by 100 mgm. of cortisone at the end of the surgical procedure and again 8 hours later. The cortisone dosage was then gradually reduced. If a second adrenalectomy was to be performed, the patient was prepared preoperatively with cortisone. Cortisone, 100 mgm., with 5 mgm. of desoxycorticosterone acetate was given immediately after the operation. Postoperatively these drugs were gradually reduced in amounts. In this series of patients there were no surgical deaths. A persistent low grade fever, sometimes accompanied by diarrhea, was noted in some of the totally adrenalectomized patients; 3 of the patients subjected to bilateral adrenalectomy developed transitory hypercalcemia and hyperphosphatemia. Following surgery, rapid redistribution of body fat was evident. Muscular strength improved slowly. Normal menstrual periods returned. Although the blood pressure often returned to normal levels, in some instances a marked hypertension was only reduced.

Prior to discharge from the hospital, the patients who had been subjected to bilateral adrenalectomy were warned to report the onset of any illness immediately. In times of major stress, the replacement regimen employed has been the same as that employed at adrenalectomy. Patients in this series have been maintained adequately with replacement therapy during the past 7 years.

—*John T. Grayhack, M.D.*

Neurofibrosarcomas of Cranial Nerve Origin. Steven G. Economou, Harry W. Southwick, and Danley P. Slaughter. *Arch. Surg.*, 1958, 77: 271.

Although neurofibrosarcomas of cranial nerve origin are relatively uncommon, their erratic course and the difficulties of surgery incited the authors to present 14 such cases. In most of the cases multiple operations were necessary due to repeated recurrences. Ten patients are still alive without evidence of recurrence, 4 of them for more than 5 years since their last operation.

There was an associated neurofibromatosis in 2 of the patients, and in both of these the outcome was fatal. In patients with generalized neurofibromatosis it is believed that surgery should be used only for the rapidly growing tumors if feasible.

If a specific nerve can be identified in regard to the origin of the tumor, a wide exposure of the nerve and extensive resection in this direction should be carried out as far as possible, otherwise large bloc resection in order to get far beyond the tumor mass. It is believed that the high incidence of local recurrence is due to multicentric origin of tumors along the nerve rather than incomplete removal. This was nicely demonstrated in several of the cases reported. Roentgen therapy has been found to be of no value.

—*Jack I. Woolf, M.D.*

Neurosurgery in Children. A. N. GUTHKELCH. *Neurochirurgia*, 1958, 1: 26.

A BRIEF REVIEW of recent literature on pediatric neurosurgery is offered by the author.

Arnold-Chiari's malformation has been shown to be a sequel of excessive growth of the entire central nervous system. The enlargement of the hemispheres results not only in excessive plication of their surfaces but also in a downward displacement of the tentorium. Thus the posterior portion of the brain is forced down into the upper cervical region. Therefore, splitting of the tentorium, suboccipital decompression, and upper cervical laminectomy may give relief of the symptoms. The theory that Arnold-Chiari's deformity is due to traction by myelomeningocele is incorrect.

Craniosynostosis should be treated in early infancy to reduce the consequences of increased intracranial pressure. Linear craniectomy is the method of choice. The edges of the wound should be lined with a polyethylene film.

Arteriovenous malformations can be diagnosed and treated at a very early age. In 2 inoperable hamartomas of the brain stem and basal ganglia, shrinkage of the vessels and relief of symptoms were obtained by the author by means of radiotherapy.

Subdural effusions result from a traumatic, inflammatory, or thrombotic lesion in the arachnoid or the blood vessels within it. The maintenance of the volume of fluid, once it has become encapsulated, is probably accomplished not by repeated hemorrhages or osmotic process but by true effusion from newly formed vessels within the membranes.

Radiotherapy has been successfully employed in medulloblastoma of the cerebellum. The author prefers iodized oil injections to pneumography in the diagnosis of gliomas of the brain stem.

If ventriculocisternostomy is indicated in infancy, efforts should be made to avoid opening the posterior fossa, as the dura in the region of the foramen magnum is very vascular.

Hemispherectomy has proved its value in the treatment of infantile hemiplegia with epilepsy and personality disorders. —*Joseph Narat, M.D.*

Treatment of the Parkinsonian Syndrome by Destruction of the Internal Pallidum (Le traitement des syndromes parkinsoniens par la destruction du pallidum interne). G. GUIOT. *Neurochirurgia*. 1958, 1: 94.

PALLIDAL DESTRUCTION by stereotaxic technique is described by the author. It has replaced the open operation which he had performed on 70 patients, using the subfrontal approach and following the optic tract.

The stereotaxic technique starts with locating the destructive lesion within the pallidum in the following manner: in the sagittal plane 15.5 mm. from the ependyma of the lateral wall of the third ventricle, in the coronal plane 3.5 mm. behind a base line joining the posterior border of the anterior commissure with the infundibular recess, and in the horizontal plane at the junction of the lower four-fifths and the upper one-fifth of this line.

The technique proper is as follows: anteroposterior projection with lead markers fixed on the outer table

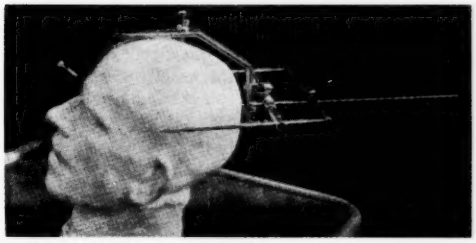


FIG. 1 (Guiot). Stereotaxic apparatus, consisting of a sagittal bar, two lateral guides, and a coagulating parasagittal probe.

of the skull in the region of the lambda and bregma allows fixation of 3 median screws of the stereotaxic apparatus in the median sagittal plane. The horizontal line passing through the point X is determined by two lateral guides. The point X on this line is then reached from above and behind, along a parasagittal plane parallel to the midline.

Favorable results in cases of progressive Parkinson's disease have not been maintained beyond 4 years. Involuntary movements accompanying chorea can also be controlled by such an operation, but in chorea indications for such a procedure are more restricted. —*Joseph Narat, M.D.*

PERIPHERAL NERVES

Nerve Injuries in the Upper Extremity. ROBERT D. LARSEN and JOSEPH L. POSCH. *Arch. Surg.*, 1958, 77: 469.

THIS REPORT from the Detroit Receiving and Grace Hospitals of the Wayne University Surgical Service concerns 325 cases of nerve injury in the upper extremity occurring over a 7 year period. Of this total, 155 occurred in the hand, 137 in the forearm and wrist, and 33 above that level. There were associated tendon injuries in 236 of the cases and associated fractures in 25. The diagnosis rarely offered difficulties, but in young children and in the uncooperative patient it was found that if the wound overlay the course of the major nerve and one could not conclusively demonstrate the fact that the nerve was intact, exploration should be carried out.

The operative technique in the management of the lacerations is described. In the freshly and cleanly incised wounds only a few millimeters of each end of the nerve are removed. The finest possible silk is utilized, tension is to be avoided, and the usual methods of gaining length are practiced. The authors believe that nerve graft is a useful operation when nerve ends cannot be approximated in any other way, and they recommend the use of the sural nerve as a convenient donor nerve.

Primary repair of injured nerves is favored, but the difference of opinion reported by others is recognized. When a nerve is partially lacerated, primary repair is particularly important. Contraindications to primary repair include severe crushing or tearing, contamination of the wound of severe degree, associated injuries of a higher priority, and inadequate facilities for the

operation. Repair at a delayed period after wounding may be carried out, and up to 18 months the return of sensation after nerve repair may be expected to be good. After 2 years the chances of success diminish. The sign of Tinel may aid in assessing a sensory nerve regeneration, and the authors point out the use and limitation of electromyographic study.

The care of the limb following repair is described in detail and continuous splinting for 4 weeks is recommended, followed by gradual mobilization of joints. Median nerve injuries seldom require splinting of the paralyzed muscles. In the case of ulnar nerve lesions, flexion contractures of the interphalangeal joints and hyperextension at the metacarpal phalangeal joints require prevention. Radial nerve paralysis requires continual splinting of the extensors of the wrist, thumb, and fingers until the paralysis is overcome. Electrical stimulation is of little value postoperatively. In assessing the results of nerve repair, suture of digital nerves is recommended as far distal as the distal interphalangeal joint.

Six patients underwent nerve graft. In 5 of these, which were cases of digital nerve graft, good return of sensation was achieved. In two-thirds of the 54 patients with primary repair of the median nerve in the proximal palm or wrist, function was regained in the thenar muscles and one-half of the secondary median nerve neurorrhaphies at this level were followed by return of function. This degree of motor return was not seen in the case of suture of the ulnar nerve.

Radial nerve function was observed to return in 13 out of 17 cases in repair above the elbow. Less satisfactory results were observed when repair was below the elbow. The return of sensation after suture was classified. Of 142 digital nerve repairs, a high degree of success was achieved in 92. Of 78 median nerve injuries at the wrist and palm, a successful result was achieved in 56. Of 14 median nerve injuries in the arm and forearm, 6 have such sensory return; in 62 of the ulnar nerve at the wrist, 39 achieved this return; and of 18 in the forearm and arm, 8 have such return. Among 17 radial nerve injuries repaired in the arm, 10 achieved this degree of return, and among 6 repairs of the sensory branch of the radial nerve, 5 achieved this return. Approximately half again as many cases of nerve suture in each location noted demonstrated return of sensation to the same degree except that 2 point discrimination was poor or absent.

Transfer of the opponens muscle is utilized for thenar muscle paralysis. The reconstructive procedure for claw hand following ulnar and median nerve paralysis is best carried out by transfer of the sublimis tendons through the lumbrical canals as the authors illustrate. Permanent radial nerve paralysis is readily corrected by tendon transfer.

—*W. Eugene Stern, M.D.*

SYMPATHETIC NERVES

Horner's Syndrome. CONRAD L. GILES and JOHN WOODWORTH HENDERSON. *Am. J. Ophth.*, 1958, 46: 289.

INTERRUPTION OF THE SYMPATHETIC NERVE SUPPLY to the eye (Horner's syndrome) usually consists of miosis, ptosis, enophthalmos, and anhidrosis. Anhidrosis may be completely absent when the lesion involves the sympathetic pathways distal to the origin of the external carotid artery, since the sweating fibers follow the external carotid artery and hence do not extend intracranially. If the lesion occurs before the patient is 2 years of age a heterochromia iridis may occur. Other reports in the literature have listed cataract formation, facial hemiatrophy, and disturbances in tear secretion. Two hundred sixteen cases have been seen at the University Hospital, Ann Arbor, Michigan.

The site of the lesion was of some diagnostic help in that involvement of the sympathetic trunk and postganglionic fibers was most usually due to neoplasms. Of 101 cases in this group, 66.5 per cent had neoplasms and of these, 77 per cent were malignant. The benign tumors were usually either neurofibromas or thyroid adenomas. Lesions involving the low cervical or high thoracic anterior roots were most frequently traumatic injuries; however, 20 per cent were due to tumors, 18.6 per cent were secondary to surgical procedures, 3 cases were due to high epidural block in obstetrical procedures, and a congenital malformation was found in 1 case. Brain stem lesions were found in 12 cases, and most of these were due to thrombosis of one of the cerebellar arteries. Multiple sclerosis and encephalitis produced the syndrome in only one case each.

In brief, this syndrome occurs most commonly in the older age groups, in which the most likely cause was found to be malignant neoplasms. In the younger group trauma was the cause much more frequently. Surgical trauma and vascular disease were comparatively rare causes.

It is suggested that a careful evaluation of all such cases should include (1) a detailed history, (2) roentgenograms of the chest, neck, and upper thoracic vertebra and skull, and (3) careful ophthalmologic and neurologic examinations.

—*Jack I. Woolf, M.D.*

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Results of Treatment of Cystic Disease of the Breast. JAMES W. HENDRICK. *Surgery*, 1958, 44: 457.

THE SYMPTOM COMPLEX of cystic disease of the breast is the most frequently encountered entity in the management of diseases of the mammary gland. This report presents the findings in 484 private female patients with cystic disease of the breast treated in the period from 1933 to 1951 and of the follow-up examinations in 90 per cent of the group.

It is assumed that one of every 15 women in the general adult population develops clinical evidence of cystic disease of the mammary gland. The highest incidence was observed between the ages of 40 and 49 years; 45 per cent of the patients were in this range.

The most common form of cystic disease is a localized area of nodularity, usually in the upper outer quadrant of one or both breasts. In 266 patients whose ages ranged from 35 to 44 years the disease was localized to one segment of the breast. When a discrete cyst is present it is usually associated with numerous smaller cysts involving the same segment of breast tissue. There were 167 patients with discrete cysts varying in size from 3 to 14 cm. in diameter; the majority of these patients were past the age of 42 years. There were 128 patients who had nipple discharge at the time of the initial examination. Serosanguineous or bloody nipple discharge, which denotes intraductal papilloma, was not observed in any patient with cystic disease.

Four patients, representing less than one per cent of this series, developed cancer; 2 had carcinomas in the same breast. The period of time between biopsy of the breast which demonstrated cystic disease and the diagnosis of cancer varied in these 4 patients from 8 to 16 years. A review of 452 patients with primary carcinoma observed during the same period that this series of patients with cystic disease was treated reveals that 4 patients had history of a previous operation for a benign lesion of the breast. The interval between the first operation and the discovery of carcinoma ranged from 14 to 20 years.

One hundred sixty-seven patients with discrete cysts of the breast observed over a period of 5 to 18 years were treated by aspiration therapy. Fifteen of these patients required two aspirations. In 19 patients a second cyst formed in another area of the same breast and in 13 patients a cyst developed in the opposite breast later. They were all successfully treated by aspiration. In only 7 of the 167 patients with discrete lumps treated by aspiration was there a residual mass following dry aspiration. These patients had surgical excision of the tumors, which were benign in all 7 cases. Patients with discrete cysts are advised that if aspiration produces bloody fluid, if the lump does not completely disappear following aspiration, if fluid is not obtained, or in the event that the lump returns after a second aspiration, the involved area of the breast will be excised for histologic examination. Regular follow-up examinations of patients in whom aspiration was performed demonstrated that carcinoma was not overlooked in any instance. The aspiration should be performed only by surgeons qualified to perform a radical mastectomy; however, this method of therapy is not recommended unless the patient agrees to return for follow-up examinations at regular intervals. Details of the technique include the use of a short-beveled 20 gauge needle following infiltration of the skin with one per cent procaine solution. Following aspiration a pressure dressing should be applied.

In patients with localized areas of cystic disease and those with discrete cysts who will not agree to regular inspection following aspiration therapy, surgical excision of the involved area is performed. Three hundred eleven patients had this type of therapy. Three patients had simple mastectomy because of severe mastodynia and the fact that the involved breasts were riddled with small cysts.

—Bernard C. Gerber, M.D.

Sex Hormones and Mammary Cancer. J. TH. VAN DER WERFF. *Brit. M. J.*, 1958, 2: 881.

WHILE the effect of hormones on the growth of cancer cells in general is still completely unknown, some relationship exists between sex hormones and cancer of the breast, a relationship that clearly is exceedingly complex. This is evident from the various ways in which a patient suffering from mammary cancer reacts to sex hormone therapy.

The fact that of two mammary carcinomas of the same histologic structure, one metastasizes in an entirely different way from the other, suggests the existence of different kinds of breast cancer. Furthermore, experience shows that in spite of a similar structure and metastases, a different reaction to hormone therapy may occur to give further evidence of difference in the nature of these carcinomas which so far it has not been possible to distinguish clearly by other means.

The androgens seldom seem to cause a rapid exacerbation of mammary cancer, but usually have either a clearly favorable, although merely palliative, effect or none at all. Likewise the estrogens have either a positive, a negative, or no immediate effect upon the growth of the tumor depending upon the nature of the cancer under treatment.

The author calls attention to the fact that according to recent research, the body is capable of gradually converting certain androgens into estrogens. This has long been suspected, not only from the similarity in structure of the estrogenic and androgenic steroids, but also from the fact that androgen therapy produced an increase in estrogen excretion. It is clear, therefore, that for prolonged administration a steroid is needed that does not show this conversion and yet possesses the favorable properties of the androgens used for the treatment of mammary carcinoma.

Apparently the new compound, norandrostenolone phenylpropionate (durabolin), compares favorably as regards all these properties with testosterone propion-

ate, the first but until now the most important hormone for use in mammary carcinoma. In the first place it seems that conversion in the body into estrogen is not so easy or is perhaps even impossible. In addition durabolin has an anabolic effect twelve times more powerful than testosterone propionate. The calcium excretion in patients with bone metastases can be greatly reduced after administration of the drug, while the virilizing effect is far less pronounced. The duration of action of this drug is long, so that weekly injections of 25 mgm. are sufficient. The preparation is well tolerated and patients who show a favorable response often begin to feel much better, acquire a good appetite, and look well. Although apparently the conversion into estrogen cannot be the cause, it has unfortunately been found that in the case of this drug the action wears off. From a certain moment the responsive patients are seen to go slowly downhill and finally succumb.

Durabolin was used in 13 patients who had such marked generalized metastases that recovery could not be expected. Eight of the patients with severe and extensive metastases succumbed soon after the onset of therapy whereas in 8 other patients the metastases were not yet very pronounced and durabolin was administered to improve their general condition. All of these patients are still alive. In practically all of the 21 patients considerable improvement in the general condition was observed during the weekly administration of 25 mgm. of durabolin. Improvement became manifest in the alleviation of pain which was sometimes very severe as a result of bone metastases, in a good appetite which led to a considerable weight-gain, and in a general sense of well-being. This improvement, however, was often in complete contrast to the radiologic findings.

In contrast to testosterone propionate, the durabolin was well tolerated for many months and the unpleasant symptoms of virilization occurred only sporadically. Blood calcium studies showed an occasional fall in serum levels but this never produced tetany, and varying responses of the alkaline phosphatase were also found.

Three cases are presented to show the apparent temporary favorable response to the administration of durabolin. The authors concluded that the drug is usually a powerful and long acting palliative which, because of its very slight virilizing action, is a real asset in the treatment of advanced carcinoma of the breast. —*Matthew H. Evoy, M.D.*

Fluoxymesterone Therapy in Advanced Breast Cancer. B. J. KENNEDY. *N. England J. M.*, 1958, 259: 673.

TO BE OF REAL VALUE a new compound should be as good as or better than testosterone propionate in its antitumor effect, should be an oral preparation to increase the economy and ease of administration, and should produce fewer undesirable side effects. Fluoxymesterone has been derived chemically from 17 a-methyltestosterone by the introduction of an hydroxyl and fluorine group. It is about five times as potent as methyltestosterone.

Fifty-six patients with disseminated breast cancer were treated over a 2 year period; 48 received no previous hormonal therapy. Eight patients had undergone a total surgical hypophysectomy. On reactivation of the cancer fluoxymesterone was employed. All patients were postmenopausal except 1. The dose of fluoxymesterone employed was 20 mgm. daily in 36 patients and 40 mgm. daily in 20 patients. There was no apparent difference in response with either dose. Continuous therapy was given from half a month to 17 months in all 56 patients. In 2 patients hypercalcemia occurred at two and three weeks necessitating discontinuance of the compound.

The lesions that improved during fluoxymesterone therapy were predominantly osseous, but objective improvement was also noted in lesions of the skin, lymph nodes, and pleura and in the primary breast mass. The duration of objective response varied from 3 to 17 months with an average of 9 months. Of 56 patients 27 remained alive, 14 had an objective response, and 29 died, of whom only 5 demonstrated objective improvement. The average survival for the patients demonstrating improvement was greater (14.8 months) than that in the nonresponding group (8.2 months). Side effects noted were oily skin, alopecia, and hoarseness of a marked degree similar to that noted with testosterone propionate with a very mild increase in libido. Other side effects noted, although usually less severe than with testosterone, were acne, hirsutism with typical male distribution of hair, and edema. There was an increase in red cell mass from 2 to 4 grams per mm. in 25 patients.

It is concluded that fluoxymesterone is an effective agent in the treatment of advanced breast cancer, it is easier to administer than intramuscular preparations, and its antitumor effect is at least as effective as that of testosterone propionate. In this small number of patients it may be superior to testosterone propionate. The intensity of side effects is not as great as with testosterone propionate and at the present time fluoxymesterone is considered by the author to be the androgen of choice.

—*Allan D. Callow, M.D.*

TRACHEA, LUNGS, AND PLEURA

Diagnosis of Total Transposition of the Pulmonary Veins (Die Diagnostik der kompletten Lungenvenentransposition). H. HALLERBACH and A. SCHAEDE. *Fortsch. Roentgenstrahl.*, 1958, 89: 152.

THE AUTHORS, of the Medical Department and the Roentgenologic Institute of the University of Bonn, Germany, discuss the embryology, the anatomy, and the pathophysiologic basis in total transposition of the pulmonary veins and report on their findings in 20 pertinent cases of their own observation.

In the human embryo anastomoses exist between the splanchnic plexus and the pulmonary veins which normally atrophy before the fifteenth week. If, however, one or more of these anastomoses persists and enlarges, pathologic communications between the large veins will result. In a later stage of embryonal development the four pulmonary veins merge into a single vessel which empties into the right auricle. Normally, this vessel disappears and the pulmonary veins connect with the left auricle. If, however, this vessel persists the pulmonary veins may empty into the right auricle, the vena cava, or one of the other

large veins in the vicinity of the heart. Transposition into the coronary sinus, the subclavian, or azygos veins, and even into the portal vein, has been described. Partial transposition may not cause symptoms. Clinical symptoms are assumed to result only if more than 50 per cent of the pulmonary vein blood flows into the right side of the heart.

Transposition of the pulmonary veins leads to hypertrophy and dilatation of the right side of the heart with consecutive heart failure and pulmonary sclerosis. Total transposition is compatible with life only if at the same time an open foramen ovale or a septum defect or an open ductus arteriosus is present. The prognosis in these cases depends on the width of the communication between the right and left sides of the heart. According to one report in the literature 80 per cent of the children die during the first year of life, the rest before the age of 7 years. The authors' experience differs considerably from this gloomy picture. Of 2,000 patients who underwent a thorough investigation of the heart they found 20 in whom the diagnosis of total transposition of the pulmonary veins was made; of these, 15 were between 5 and 12 years of age, the remaining 5 between 17 and 26 years old.

The clinical picture and the electrocardiogram do not differ much from those in cases of other anomalies with a left to right shunt. The diagnosis is established by radiogram, kymogram, tomogram, heart catheterization, and angiocardiography. None of these methods alone is sufficient to establish the diagnosis, and even by combining the results of all these methods it is often difficult to determine the exact location of the abnormal course of the veins. Only in the case of the pulmonary veins emptying into the superior vena cava by way of a persisting left vena cava and the left anonyma are the findings always typical.

For the diagnosis of total transposition the oxygen saturation is the most important single test. The oxygen saturation in the right auricle is always higher than that in the venae cavae. However, this is the case also in partial transposition and in septal defect of the atrium. Only equal oxygen saturation in the right auricle and the peripheral arteries is definitely pathognomonic for total transposition of the pulmonary veins.

Angiocardiography has a limited importance only. If the pulmonary veins empty into the right auricle directly, no characteristic pictures are obtainable, because the contrast material fills all portions of the heart practically at the same time. Because of the dilution of the contrast blood by the blood coming from the pulmonary veins the visualization is always poor. Only emptying of the pulmonary veins into the superior vena cava can be visualized fairly well in the angiocardiogram.

This interesting article is accompanied by more than 40 instructive roentgenograms, kymograms, and pictures of heart catheterization studies. It should be studied in the original.

—*Werner M. Solmitz, M.D.*

Thrombosis of the Major Pulmonary Arteries. J. Alan S. Amos. *Brit. M. J.*, 1958, 2: 659.

Thrombosis of the larger pulmonary arteries is being increasingly reported as the cause of striking clinical deterioration in a wide variety of illnesses. Nineteen cases form the basis of this report with a detailed study of the clinical and pathologic features of these patients and a description of the variability of the clinical course. The series of 19 patients was divided into three groups: those in whom the thrombosis followed pulmonary embolism, those in whom in situ thrombosis of the major pulmonary artery developed, and those grouped as other cases, specifically one of pneumococcal septicemia and one of cerebral vascular accident with prolonged coma.

With the availability of prolonged anticoagulant therapy it becomes increasingly important to recognize the syndromes of chronic thrombotic obstruction of the pulmonary vessels during life. In all of the 19 patients described here thrombosis affected the pulmonary trunk or the main left or right branches proximal to the hilum. Patients in whom pulmonary embolism was the immediate cause of death were excluded. The ages of the patients ranged from 22 months to 78 years, 14 patients being more than 50 years of age at the time of death. In 6 patients there was a history of frank pulmonary embolism during the preceding 3 months. Of the 9 examples of presumed in situ thrombosis 6 had chronic heart disease and 3 emphysema; there was no definite history of thrombosis of the leg veins nor did autopsy reveal thrombi in the peripheral veins of similar age to the pulmonary artery thrombi. The most frequently observed clinical picture was increasing dyspnea, cyanosis, and failure of the right side of the heart. A review of clinical findings in this series revealed a number of features thought to be associated with the increasing thrombotic obstruction. These were the sudden onset of acute cor pulmonale with striking coldness of the extremities, paroxysmal epigastric pain, development of a prolonged generalized systolic murmur, visible pulsations in the pulmonary area with greater accentuation of the second sound, and possibly the development of paroxysmal cardiac arrythmias. Electrocardiograms revealed no constant changes. The most frequent finding radiographically was conspicuous enlargement of the shadows of the pulmonary vessel.

Three types of clinical course were seen: pulmonary embolism often repeated with a subacute cor pulmonale, progression of pulmonary artery thrombosis with the development of acute cor pulmonale, and gradual worsening of chronic cor pulmonale. The condition may be expected when there is unexplained deterioration in any of the known predisposing cardiac or respiratory illnesses. It may be strongly suspected when there is a history of venous thrombosis of the legs followed by cardiorespiratory symptoms. The time interval before these symptoms occur may be measured in years after the original episode of thrombosis and pulmonary embolism. Thrombosis of the major pulmonary arteries may have to be considered in the diagnosis of any case of acute, subacute, or chronic cor pulmonale. —*Allan D. Callow, M.D.*

Reversible Bronchiectasis. Sidney W. Nelson and Anthimos Christoforidis. *Radiology*, 1958, 71: 375.

In the Ohio State University Health Center during the past few years an effort has been made to demon-

strate bronchographically all of the bronchopulmonary segments in patients suspected of having bronchiectasis. In addition, the authors believe that a careful repetition of the bronchogram is advisable immediately prior to contemplated operation if several months have elapsed between the original bronchographic study and the admission for elective surgery. As a result of this practice they have seen, during a 15 month period, 4 patients in whom a later bronchogram showed complete disappearance of bronchiectasis which had been clearly evident on the previous examination.

When there has been destruction of the musculoelastic skeleton of the bronchial wall, with subsequent permanent dilatation of the bronchi, the only curative treatment is the surgical excision of the involved area. In the study of surgical and postmortem specimens, it has been noted that the dilated bronchi were sometimes microscopically and grossly intact, except for inflammatory changes. Therefore, from the strict pathological standpoint, it is understandable that a return to normal is possible if intensive medical therapy is successful in alleviating the infection before actual tissue destruction has occurred.

Four case reports are presented which represent instances of reversible bronchiectasis in patients seen for contemplated excisional therapy. All cases occurred in children or young adults. In 3 of the 4 the first bronchographic study was performed following treatment for pneumonia and it demonstrated bronchiectasis, for which surgical excision was advised. At the time the patients were readmitted for surgery a repeat bronchogram was done which demonstrated a normal bronchial tree.

—Bernard C. Gerber, M.D.

Staphylococcic Empyema. G. J. MAGOVERN and BRIAN BLADES. *J. Am. M. Ass.*, 1958, 168: 365.

A TOTAL of 10 case reports on acute empyema requiring surgical drainage are discussed by the authors. Staphylococcic empyema is usually secondary to a bacterial or virus pneumonia or an infection of extrathoracic origin. This may be caused by bacterial drainage into a sterile pleural effusion, by rupture of a subpleural abscess, by septic emboli, or by external trauma. The mortality rate of staphylococcic empyema has dropped in children to its present insignificant rate from a previous 50 to 70 per cent.

The empyema may have various locations; in the costophrenic sulcus, in the anterior or posterior paramediastinal region, or on the side. The last type is determined by roentgenograms taken from various positions. Roentgenograms in children often show bleb formation together with pneumonia and a pyopneumothorax or pleural effusion. The acute bleb is caused by bronchiolar obstruction, assumes a large size, and is frequently mistaken for pneumothorax. If thoracentesis is performed and the bleb is punctured, a tension pneumothorax may be the result.

The diagnosis of empyema must be confirmed by the aspiration of purulent fluid. A milky-colored fluid from which a positive smear or culture is obtained indicates empyema. A clear fluid is usually indicative of a sterile transudation. If the fluid is nonloculated it is usually confined to the costophrenic sulcus and underwater drainage should be instituted. Open drainage would result in pneumothorax. Drainage is made through the sixth intercostal space if the empyema is anterior, through the seventh or eighth intercostal space if lateral, and in the ninth or tenth space if posterior. The drainage tube should be about 28F and may be inserted under local anesthesia.

—B. G. P. Shafiroff, M.D.

Chondroma of the Lung (Text in Greek). N. ANEZIRIS. *Acta chir. hellèn.*, 1958, 5: 473.

ACCORDING TO THE AUTHOR this case report of an osteochondroma of the lung parenchyma comprises the eighth one of pure chondroma and osteochondroma of the lung. There have been also 110 cases of hamartoma of the lung containing chondromatous elements which have been reported.

Clinically, the tumor usually remains asymptomatic for many years and is discovered accidentally. Whenever, because of continuous growth, symptoms develop, they consist of pain, cough, expectoration, dyspnea, and mild cyanosis. Attacks of bronchial asthma, fever, and hemoptysis have been reported.

The roentgenogram usually shows a round shadow in the lung parenchyma which is more or less well defined, thick, and homogeneous. Bronchoscopy is usually negative.

A differential diagnosis must be made from echinococcus cyst of the lung and tuberculoma. The presence of calcium seen in the roentgenogram is characteristic of chondroma, but this sign is present in only one-third of the cases. Nevertheless, the absence of eosinophiles in the peripheral blood smear and a negative Casoni-Weinberg skin test refute the diagnosis of echinococcus cyst. The past history of the patient and the increased sedimentation rate might be indicative of tuberculosis.

The reported case was typical of the description given. The chondroma was accidentally found in the left lung field of a chest roentgenogram of a 56 year old man who suffered from alcoholism. One year after the mass was discovered, the patient was admitted to the hospital complaining of mild left lower chest pain of 15 days' duration. A second chest soentgenogram taken at this time showed an orangerized mass in the left lower lung field, which had grown slowly as compared to the shadow in the roentgenogram taken one year previously. A tomogram showed calcification of the mass.

On bronchoscopy stenosis of the lingular bronchus was observed. Histologic examination of the biopsy specimen taken from the stenosed bronchus showed only inflammatory changes.

The eosinophil count was normal and the Casoni-Weinberg skin test for echinococcus was negative. The sedimentation rate was also normal.

On thoracotomy the tumor was well circumscribed and could be enucleated easily, but since it had compressed most of the lung parenchyma of the lingula, the latter was totally removed. No more tissue was excised since on gross examination the tissue looked benign. The benign nature of the tumor was proved on subsequent histologic examination, which showed a chondroma with areas of osteoid transformation.

The patient had an uneventful recovery and was discharged in 20 days. —*Nicholas J. Demos, M.D.*

Clinical and Statistical Analysis of 801 Patients with Bronchial Carcinoma (Analytische Untersuchungen ueber das Bronchialcarcinom). U. J. WASSNER and W. KNOTHE. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 288: 462.

AS IN ALL CANCERS early diagnosis is a prerequisite for therapeutic success. This study of 801 patients with bronchial carcinoma was undertaken to find possible relationships of history as stated by the patient and other different tumor characteristics.

The number of patients entering the authors' institution increased in the past years rather markedly, but this was due to an increase of the available surgical facilities and does not represent a true increase in the incidence of bronchial cancer. Despite this increase in patient material the percentage of resectable tumors remained stationary since 1952 following an increase in the previous years. The duration of symptoms prior to admission decreased from 8 months in 1950 to 3 months in 1956.

The typical age for bronchial carcinoma is from 49 to 61 years and about 50 per cent of the patients fall into this group. The relationship of age to the duration of symptoms was compared in operable and inoperable patients. Most cancers were operable if the history was shorter than 4.5 months after the onset of symptoms: this factor was shortened at the age of 40 to less than 4 months and slightly prolonged at the age of 60. At 40 years of age symptoms lasting longer than one year suggested inoperability.

The patient material was divided from the histological standpoint into squamous cell and undifferentiated small cell carcinomas. The duration of symptoms in patients with squamous cell carcinoma between the ages of 35 and 75 years was approximately the same and in the oldest group only one month longer than in the youngest. In patients with small cell carcinoma the relationship was similar in the age group from 40 to 43 years. The older patients, contrariwise, showed characteristically short histories which indicated a more rapid tumor growth.

In the operable group of patients squamous cell carcinoma predominated. The median of the duration of symptoms in cases of undifferentiated small cell carcinomas was similar to that of all the operable bronchial carcinomas at the peak of their highest incidence. Undifferentiated small cell carcinomas are therefore most amenable to operative therapy during the usual period of highest bronchial cancer incidence.

There is a definite relationship between the patient's age, duration of the disease from the onset of symptoms to the therapeutic attempt, and the histological type: the duration of symptoms and its relation to the patient's age will suggest the tumor type. In patients older than 60 years, symptomatology of more than 6 months suggests a squamous cell carcinoma, and a short history of 3 or less months an undifferentiated small cell carcinoma; however, no such relationship was found in the 40 to 50 year age group.

These studies explain why the longevity is not necessarily the best in patients relating a short history, since most such patients will have undifferentiated small cell carcinomas. Patients in the age span from 55 to 60 years who had surgical therapy within 3 to 6 months after onset of their symptoms had the most favorable prognosis, but, even so, undifferentiated carcinomas will have metastasized by the time of the first complaints. Squamous carcinomas, in general, metastasize later, and as metastases primarily influence the survival the prognosis is better. The tumor type, age, and symptomatology relationships explain Von Lambert, Overholt, and Ochsner's observations of the curious fact that operable cases had a longer history than inoperable ones.

Analysis of the bronchial cancer site indicates that tumors originate more commonly from the pulmonary lobe bronchi than from the main bronchi. The first group also is more operable and there are more survivals. Of cancers of the upper and lower lobe every second was operable and every seventh patient survived longer than one year. Of cancers of the main bronchus every tenth was operable and every sixty-fifth patient survived. Of cancers of the middle lobe every fourth was operable and every fifteenth patient survived. The histological character of the tumors did

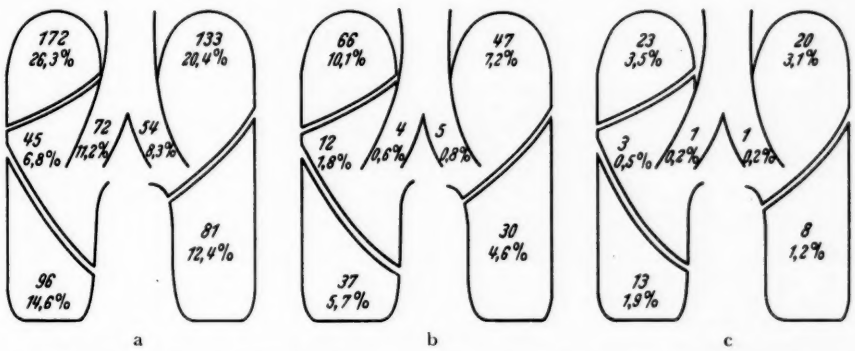


FIG. 1 (Wassner, Knothe). Localization of bronchial carcinoma in the pulmonary lobes and main bronchi: a, total material, b, operable tumors, and c, survivals.

not explain this phenomenon. The suggestion that in a bronchus with a larger lumen, symptomatic obstruction occurs later, at a time when the cancer has progressed, is plausible. The proximity to hilar lymph nodes must be of significance.

An attempt was made to correlate mathematically the different manifestations of bronchial carcinomas as follows:

$$\frac{\text{Age of patient} \times \text{Tumor character} \times \text{Location}}{\text{History in months}} = \text{Carcinoma number}$$

The reason for developing this aspect was the conclusion that the age of the patient and the duration of symptoms by themselves do not express the biological character of the tumor. The increasing number of patients with a shorter onset of symptoms coming to the hospital should have caused an increase in the number of operable cancers, but such was not the case. The duration of the symptomatology depended on the histological character of the tumor and the specific growth rate of the tumor depended on the patient's age. All three factors influenced the operability and survival of the patient.

From such calculations it was possible to conclude that the greater the carcinoma number, the longer the survival of the patient. The value for surviving squamous cell carcinoma patients of one year or more was 224 and for all the bronchial cancer survivors, 178. The carcinoma number for all operable tumors, all squamous cell cancers, and the total analyzed was 150, 134, and 125, respectively. The number for all inoperable cases was 108 and for survivors who had had small cell carcinomas, 107. For small cell carcinomas the average value was 72. The lowest values found were for cancers of the main bronchus and of the middle lobe, 22 and 46, respectively. This theoretical evaluation assumes practical importance as it suggests preoperatively the outcome of the disease in an individual patient. It may be generalized that the future course of a patient is determined at the time of the first symptoms; this is true especially of patients with undifferentiated small cell carcinomas.

The future course of a patient suffering from bronchial cancer may well be determined at the time of the first symptoms; this is true especially in cases of undifferentiated small cell carcinomas. The authors do not mention the surgical procedures used and any possible relationship of the type of operation to survival. —*Karel B. Absolon, M.D.*

Should We Insist on "Radical Pneumonectomy" as a Routine Procedure in the Treatment of Carcinoma of the Lung? JULIAN JOHNSON, CHARLES K. KIRBY, and WILLIAM S. BLAKEMORE. *J. Thorac. Surg.*, 1958, 36: 309.

THE AUTHORS state that the term "radical pneumonectomy" implies the removal of all possible mediastinal areolar tissue containing the lymphatics, in continuity with the lung. As described by Watson the dissection starts at the apex of the mediastinum and all areolar tissue and lymph nodes are reflected downward as the trachea, esophagus, and other important structures, including the contralateral bronchus, are partially "skeletonized."

Inasmuch as the authors believe that this type of dissection will result in a higher mortality, they have reviewed their series in which a standard pneumonectomy only was performed. A group of 344 patients were seen more than 5 years prior to this report. Of this group 192, or 56 per cent, were explored and 116, or 34 per cent, were subjected to pulmonary resection. The operative mortality was 7.7 per cent. Thirty-one, or 26.7 per cent, of these subjected to resection (9 per cent of the total number of patients) survived 5 years or more. The 5 year survival rate so far reported following radical pneumonectomy is not significantly higher than the authors obtained with their standard type of resection.

The authors think that until it can be shown that radical pneumonectomy produces superior results, the thoracic surgeon is not obligated to perform this operation. However, they do not wish to discourage the resection of all grossly involved tumor tissue and believe that a real effort should be made to get around the locally invasive tumor whenever possible.

The authors studied blood vessel invasion and believe that this is of greater prognostic significance than lymph node invasion. Whereas there was only a 6 per cent 5 year survival among the patients with blood vessel invasion in the tumor, there was a 75 per cent 5 year survival among those without blood vessel invasion. This may in part account for the fact that radical pneumonectomy to date has not produced the great improvement in the 5 year survival rate which was anticipated. —*John H. Schneewind, M.D.*

Lung Cancer Death Rates in England and Wales Compared with Those in the United States of America. E. CUYLER HAMMOND. *Brit. M. J.*, 1958, 2: 649.

THE DEATH RATES for cancer of the lung in England were 2.1 times higher for males and 1.6 times higher for females than the corresponding rates in the United States. In the 50 to 69 year male group this death rate was 233/100,000 in England and 115/100,000 in the United States for 1956. The female death rate for this condition has continued to increase in England but seems to have leveled off in the United States since 1948. Cancer of the lung is related to cigarette smoking and other associated factors.

Consumption per adult per annum averaged 2,500 in England and 3,195 cigarettes in the United States. Inhaling of cigarette smoke averaged 82 to 84 per cent for males of both countries. American smokers discarded about 41 per cent of the filtered cigarette and 38 per cent of the regular cigarette before its completion. The amount of nicotine in various brands varied from 1.8 to 3.1 mgm. and the amount of tar from 25.6 to 42.8 mgm. The main stream smoke of the average cigarette yielded 2.6 mgm. of nicotine and 28.8 mgm. of tar, while filtered tip cigarettes yielded 1.1 mgm. of nicotine and 19.7 mgm. of tar.

Other factors considered in this study were air pollution, occupational exposures, and other possible environmental carcinogenic sources. In Liverpool, the death rate of cancer of the lung was 100/100,000 higher than in the rural areas of Wales and 42 per cent higher than any other comparable region in England. In relation to smoking habits, the death rate from cancer of the lung was about 250/100,000/

year higher among heavy smokers than among nonsmokers, and for both groups it was 20/100,000/year higher in large cities than in rural areas. Climate and smog may be significant factors in the etiology of carcinoma of the lung in as much as the latter are causative of bronchitis and other pulmonary disorders affecting susceptibility. —*B. G. P. Shafiroff, M.D.*

The Clinical Significance of Cor Pulmonale in the Reduction of Cardiopulmonary Reserve Following Extensive Pulmonary Resection. ROBERT W. HARRISON, WILLIAM E. ADAMS, EDWIN T. LONG, BENJAMIN BURROWS, and Others. *J. Thorac. Surg.*, 1958, 36: 352.

IT HAS BEEN RECOGNIZED for some time that in certain individuals, notably those in the older age group, pulmonary resection (pneumonectomy) with an immediate reduction in cardiorespiratory reserve results in cor pulmonale, right heart failure, and death. However, more recently interest has been aroused by a group of postpneumonectomy patients who were able to adjust to the immediate effects of pneumonectomy and resume their work and activities without disability only, years later, to begin to experience progressive dyspnea on exertion resulting in a marked reduction of their functional capacity and sometimes forcing the individual into a state of retirement and semi-invalidism. The "late" effects experienced by these individuals were not always well correlated with abnormalities in their pulmonary function studies. Occasionally, such a patient would present the findings of right heart failure.

This article presents extensive physiologic studies performed on a series of patients at various intervals following pneumonectomy and bilateral resections. Twenty-nine patients ranging in age from 23 to 74 years, were studied. Pneumonectomy had been performed in 25 of the 29 cases. The studies were performed from 3 weeks to 15.5 years after the surgical procedures. Cardiac catheterization was employed to measure right heart pressures, and cardiac output at rest and during moderate exercise. Extensive determinations of pulmonary function were also made. Detailed tabulations of these results are presented. The patient's functional capacity was graded on a scale of 1 to 4 and results of the studies were compared with the functional capacity of each individual. The older the patient at the time he underwent pneumonectomy, the more likely he was to experience a reduction of functional capacity later. Reduction of the functional capacity correlated well with the reduction of maximum breathing capacity and maximum midexpiratory flow, and correlated inversely with the increase in residual volume.

These observations would support the impression that in these patients there were emphysematous changes in the remaining lung, as represented by marked overdistention, increased airway resistance, as well as arterial oxygen unsaturation and abnormalities in the alveolar gas mixing (abnormal nitrogen washout curves).

Comparison of the functional capacity with pulmonary artery pressures at rest and during moderate exercise suggested a direct relationship. As the functional incapacity increased, the levels of pulmonary artery pressure at rest and during exercise were found to become more elevated. Reduction of functional capacity appeared to be more closely related to the effects of pulmonary hypertension than alterations in the arterial oxygen saturation. The relationship of the pulmonary arterial pressure to the pulmonary blood flow in the lung remaining after pneumonectomy differed from that of a normal lung and suggested a limitation in the expansibility of the pulmonary vascular bed. —*Bernard C. Gerber, M.D.*

HEART AND PERICARDIUM

The Eisenmenger Syndrome. PAUL WOOD. *Brit. M. J.*, 1958, 2: 701, 755.

THE EISENMENGER COMPLEX may be redefined with great advantage. Almost all writers have defined it as a cyanotic form of congenital heart disease with a large ventricular septal defect and overriding of the aorta and, in recent years, pulmonary hypertension has been added. In the light of present knowledge, however, and fitting better with Eisenmenger's description, ideas, and insistence on the artificiality of the override, a better definition would be pulmonary hypertension at the systemic level, caused by a high pulmonary vascular resistance with reversed or bidirectional shunt through a large ventricular septal defect (measuring 1.5 to 3 centimeters across).

The author lists twelve diseases which may cause this syndrome. They are: patent ductus arteriosus, aortopulmonary septal defect, persistent truncus arteriosus, transposition of the great vessels, corrected transposition, single ventricle, ventricular septal defect, common atrioventricular canal, single atrium, atrial septal defect, hemianomalous pulmonary venous drainage, and total anomalous pulmonary venous drainage.

The author's analysis is based on a consecutive series of 127 cases of Eisenmenger's syndrome studied personally over a period of 11 years. In this period of time a correct diagnosis was made in only 60 per cent of the cases and this rate of error was felt by the author to be far in excess of that experienced with any other form of congenital heart disease.

The Eisenmenger's syndrome accounted for 8 per cent of the first 1,000 cases of congenital heart disease in the author's series. The frequency of the Eisenmenger reaction in relation to the site and size of the defect was determined. Of 66 patients with large aortopulmonary defects 53 had an Eisenmenger reaction; of 179 with interventricular defects 97 had large defects and of these 97, 52 had an Eisenmenger reaction; of 214 with large interatrial defects only 9 had Eisenmenger's reaction.

The average age of patients with uncomplicated cases of patent ductus, ventricular septal defect, and atrial septal defect when first seen was 18, 13, and 26 respectively when complicated by the Eisenmenger reaction; otherwise similar cases had an average age of 19, 22, and 35 respectively.

In discussing associated anomalies the author makes the following points:

1. When congenital heart disease occurred in more than one member of a family, it was nearly always of the same kind.

2. Arachnodactyly was far more often associated with atrial septal defect than with any other anomaly.

3. Deformities of the limbs were associated with ventricular septal defect in seven out of eight instances.

4. Maternal rubella favored patent ductus.

5. Mongols had persistent ostium primum.

6. Hypertelorism alone was recognized in 20 per cent of cases with pulmonary stenosis and reversed interatrial shunt.

Common to all cases of the Eisenmenger syndrome are central cyanosis, clubbing of the fingers, polycythemia, and breathlessness on effort, usually dating from infancy. Recurrent hemoptysis begins in adult life. Physical signs common to all groups include a small or normal pulse, normal venous pressure, an impalpable left ventricle, a slight lift over the right ventricle, a loud pulmonary ejection click followed by a short pulmonary systolic murmur, and often a loud pulmonary diastolic murmur. The electrocardiogram shows a normal or rather prominent P wave, and usually moderate or considerable right ventricular preponderance. Angiocardiography reveals conspicuous dilatation of the pulmonary artery and slight to moderate cardiac enlargement.

With regard to the distinguishing features of individual members of the Eisenmenger group the following are discussed:

Patent ductus: Effort intolerance is relatively slight, squatting is very rare, and most cases are acyanotic. Differential cyanosis is pathognomonic.

Eisenmenger's complex itself is the most probable diagnosis if the patient is male.

Transposition or corrected transposition: Combined with ventricular septal defect and a high pulmonary vascular resistance this entity is clinically identical with Eisenmenger's complex.

As defined in the introduction the Eisenmenger syndrome is pulmonary hypertension at or around the systemic level due to a high pulmonary vascular resistance.

The following general characteristics of the Eisenmenger syndrome are noted:

1. The catheter passed through the defect in 90 per cent of the ducts, in one-third of the aortopulmonary windows, 28 per cent of the ventricular septal defects, and two-thirds of the atrial septal defects.

2. A patent foramen ovale was penetrated in 4 cases of Eisenmenger's complex.

3. The pulmonary capillary venous pressure was uniformly normal or low.

4. Pulmonary and systemic blood pressures were practically identical in all varieties of Eisenmenger's syndrome in which the shunt was at aortopulmonary or ventricular level.

5. Shunts were bidirectional rather than wholly reversed in 42 per cent of cases with patent ductus, in 90 per cent of those with ventricular septal defect, and 85 per cent of those with atrial septal defect.

6. Pulmonary incompetence increased the oxygen saturation and tricuspid incompetence influenced right atrial samples similarly.

7. The pulmonary blood flow ranged between 2 and 7 liters per minute in all groups.

A right-sided aortic arch was demonstrated on the roentgenogram in 16 per cent of cases. A rounded shadow overlying the aortic knuckle, which looked double-edged, was seen in 2 cases of patent ductus. Calcification of the duct was seen once. As a rule, however, the characteristic feature in all varieties of the Eisenmenger syndrome is conspicuous dilatation of the pulmonary arch. Dilatation of the right branch of the pulmonary artery was remarkable in only 6 per cent of the cases. Diminished pulmonary vascular markings beyond the main hilar branches were observed in 54 to 62 per cent of all groups. Cardiac enlargement was greatest with atrial septal defect.

The author then discusses the distinctive characteristics of individual members of the Eisenmenger group.

Patent Ductus. The catheter passed through the duct more easily than through any other central communication between the two circulations. The shunt was wholly reversed far more frequently than with other defects. Patent ductus was the only lesion which was occasionally associated with no shunt. Differential oxygen desaturation between right brachial and femoral samples was pathognomonic of patent ductus.

Aortopulmonary Septal Defect. When the catheter passed through the defect it entered the ascending aorta from the pulmonary artery.

Eisenmenger's Complex. Passage of the catheter via the defect in 28 per cent of the cases into the ascending aorta followed a characteristic medial course as in Fallot's tetralogy.

Single Ventricle. In all respects but one these cases resembled Eisenmenger's complex. The one distinctive feature was the similarity of aortic (or arterial), pulmonary artery, and ventricular samples.

Transposition of the Great Vessels. These cases also resembled Eisenmenger's complex in all respects but one. The distinctive feature was the higher oxygen saturation of samples from the pulmonary artery.

Persistent Truncus. There were three characteristic features in the two cases studied. (1) The physiological situation was similar to that in aortopulmonary septal defect. (2) The catheter entered the pulmonary arteries from the "aorta." (3) Samples from the "aorta" and pulmonary arteries were identical.

Atrial Septal Defect. (1) The catheter passed through the defect in two-thirds of 18 proved cases. (2) The pulmonary artery pressure was less than the systemic pressure. (3) A direct shunt at atrial level was demonstrated in 85 per cent of the cases. (4) The oxygen saturation of left atrial samples averaged 81 per cent.

Persistent Ostium Primum. The physiologic findings in 4 cases could not be distinguished from a low atrial septal defect and ventricular septal defect.

Common Atrioventricular Canal. A single proved case had a single atrium and a single ventricle.

The best method of identifying the site of the reversed shunt in Eisenmenger's syndrome is to inject a suitable dye first into the root of the pulmonary artery, then into the right ventricle, and finally into the superior vena cava, and to record in each instance its time-concentration curve in the systemic arteries by means of a modified ear oximeter or cuvette. A reversed shunt is demonstrated by the early arrival of dye at the detection point.

Selective angiocardiography may also resolve the site of a reversed shunt, and not infrequently distinguishes between individual members of each group. Angiocardiography usually distinguishes patent ductus, transposition, corrected transposition, and persistent truncus from ventricular septal defect, and retrograde aortography separates aortopulmonary window from ventricular septal defect.

The cause of death was known in 42 of the cases. Hemoptysis was the most common natural cause, and was responsible in 29 per cent; it was usually profuse and caused death within a few minutes, as in Eisenmenger's case. The cause of hemoptysis was usually pulmonary infarction from arterial thrombosis. Surgical repair of the defect was responsible for 26 per cent of the deaths, congestive failure for 17 per cent, and ventricular fibrillation for 14 per cent.

No case of patent ductus with the Eisenmenger reaction has ever been reported with a lumen less than 5 mm. in diameter. No case of Eisenmenger's complex has ever been reported with a ventricular septal defect less than 1 cm. across. The size of an atrial septal defect has relatively little bearing on the presence or absence of a high pulmonary vascular resistance, and varies freely between 3 and 8 cm. in both uncomplicated and pulmonary hypertensive groups.

The author believes that the primary defect in Eisenmenger's disease is the muscular or fetal type of artery which remains in the pulmonary circulation. The large so-called elastic artery shows signs of some changes and the author quotes Heath who found that sections of the pulmonary artery in Eisenmenger's complex and patent ductus with reversed shunt always resembled the fetal (or aortic) pattern, whereas in atrial septal defect with pulmonary hypertension and reversed shunt, the pulmonary artery more closely resembled the adult type.

In Eisenmenger's complex the muscular arteries and the small arteries of the lungs remain thick walled during life. Eisenmenger's complex with all the classical features may be associated with a defect of the muscular part of the ventricular septum.

As a general rule neither cyanosis nor breathlessness changes appreciably during childhood or adolescence, but deterioration sets in later in adult life. The onset of recurrent hemoptysis may signal the downward trend, which in due course leads to the development of thrombo-obstructive lesions. Bacterial endocarditis occurred in only 5 per cent of the cases.

Medical treatment aims at preventing secondary thrombo-obstructive lesions by means of permanent anticoagulants. Small venesections, repeated from time to time, may be helpful in cases with gross polycythemia. Surgical results have been poor.

Within a remarkably short time after birth, then, probably within a few minutes of independent life, a pulmonary vascular resistance around 500 units falls to about 100. Four questions clamor for an answer according to the author. (1) What is the cause of the fantastic pulmonary vascular resistance in the fetus? (2) Why does it drop so precipitously at birth? (3) Why is the rapid fall halted temporarily more or less at systemic level? (4) What is responsible for the subsequent slower decline to normal? These questions, of course, are unanswerable but one suggestion is that in the fully developed fetus the pulmonary vessels are kinked in innumerable places and this can readily cause obstruction.

All that is necessary to prevent these natural forces from lowering the pulmonary vascular resistance to normal is a sufficient increase of flow to keep the pressure at systemic level. There is no common ejectile force and it follows that there can be no interatrial shunt during the critical immediate postfetal period.

In studying the subsequent course of the Eisenmenger syndrome it has been shown that during the first two years of life pulmonary hypertension at systemic level maintains the hypertrophied and contracted state of the muscular pulmonary arteries, and the high pressure type of elastic tissue in the larger elastic arteries. After about two years of continuous pulmonary hypertension, however, reactive intimal fibrosis tends to obliterate the lumen of the muscular arteries, and they no longer respond to vasodilating agents. As life advances, usually between the ages of 20 and 30 thrombo-obstructive lesions develop in the larger pulmonary arteries which increase the resistance considerably and herald the beginning of the downhill course. Cases of atrial septal defect with a low pulmonary vascular resistance may continue to have large pulmonary blood flows until they die from congestive failure between the ages of 50 and 75.

The evidence that pulmonary stenosis protects the pulmonary circulation from developing obliterative endarteritis is overwhelming.

The article includes a number of tables with summaries of the author's data and illustrations of roentgenograms and electrocardiograms.

—Peter Dineen, M.D.

Surgical Treatment of Aortic-Isthmus Stenoses (Erfahrungen bei der Operation von Aortenisthmusstenosen). K. KREMER, H. HILKE, and K. H. WILLMANN. *Langenbecks Arch. klin. Chir.*, 1958, 288: 513.

THIS ARTICLE is a report of 120 cases including photomicrograms, interesting schematic sketches, and discussion of prosthetic materials. Patients with aortic-isthmus stenosis must be given the benefit of surgery. Aortitis in patients more than 45 years of age, subacute bacterial endocarditis, and severe damage of the heart function are contraindications. If aortic-isthmus stenosis is associated with other congenital heart lesions, the prognosis is clouded.

The object of surgical intervention should be direct anastomosis (Cross-Craford), but not at the risk of unreliable suture lines. Transplantation should be limited to a minimum.

Classifying aortic-isthmus stenosis into groups of adult and infantile forms is unsatisfactory. Aside from basic anatomical concepts, the evaluation of the ductus botalli is of paramount importance, (direction of the shunt). *—Otto Weiss, M.D.*

The Clinical Use of Hypothermia Following Cardiac Arrest. G. RAINEY WILLIAMS and FRANK SPENCER. *Ann. Surg.*, 1958, 148: 462.

ALTHOUGH CARDIAC MASSAGE may be effective in restoring the heart beat, death nevertheless ensues as a complication due to cerebral edema and anoxia.

Edema of the brain is related to injury of the capillary endothelium and the escape of fluid through the vascular space. It is increased with carbon dioxide retention which causes vasodilatation and an increase of the intravascular fluid. Enlargement of the brain results in herniation through the tentorial opening which causes obstruction of the spinal fluid circulation and hemorrhage in the midbrain. Hypothermia applied promptly after cardiac resuscitation prevents expansion of the brain and protects against anoxia through reduction in the consumption of cerebral oxygen and diminution of the blood flow. A decreased cerebral metabolism may reduce cellular injury. Circulatory arrest of 10 minutes' duration followed by hypothermia increased the survival rate from 25 per cent to 83 per cent in experimental animals.

Case reports deal with 4 patients in cardiac arrest which occurred outside of the operating room. In addition to cardiac massage, endotracheal intubation or tracheotomy and sustained mechanical respiration were provided. Hypothermia in the 30 to 34 degree range was maintained for periods up to 72 hours after the return of cardiac function. Neurologic complications were minor and all of the patients recovered.

—B. G. P. Shafiroff, M.D.

The Surgical Treatment of Diseases and Injuries to the Heart and its Main Vessels (Ueber die operative Behandlung von Erkrankungen und Verletzungen des Herzens und der grossen Gefaesse). P. GANZ. *Chirurg*, 1958, 29: 408.

THE AUTHOR states that cardiac surgery should not be restricted only to big medical centers. If the surgeon has been well trained in this special field, such surgery can also be done in smaller hospitals. His series contained 2 cases of closure of open ductus arteriosus (Botalli), 2 cases of mitral stenosis, and 1 case of traumatic injury of the heart. Otherwise the author does not present any new ideas or points of view.

—Frank Lichtenheld, M.D.

One Stage Mitral and Tricuspid Commissurotomy. (Sulla doppia comissurotomia in un tempo per stenosi mitralica e tricuspidale). C. A. CARLON and A. TORMENE. *Acta chir. ital.*, 1958, 14: 483.

THE MITRAL VALVE is the valve most frequently involved in rheumatic heart disease. The aortic, tricuspid, and pulmonary valves follow in order of frequency. Frequently there is association of mitral and tricuspid stenosis. Bailey reported the association of tricuspid stenosis in 10 per cent of all his cases of mitral stenosis. In 400 cases of commissurotomy done at the surgical clinic of the University of Padua, there were 3 with associated tricuspid stenosis. The association of these two lesions is not a good prognostic factor. However, patients can go on living for many years without having any evidence of stasis in the pulmonary circulation.

Enlargement of the liver and edema of lower extremities are often early symptoms. It is commonly thought that the presence of tricuspid stenosis protects the lesser circulation and the right side of the heart from the untoward effects of the mitral stenosis by decreasing the amount of blood reaching the right side of the heart and the pulmonary vessels. However, the peripheral venous stasis finally damages the parenchyma of the liver and the kidneys and also increases the load of the left ventricle. There is also the constant possibility of pulmonary emboli originating from clots in the right atrium. The diagnosis of associated tricuspid stenosis is suggested by the presence of mild cyanosis which does not respond to the administration of digitalis. The neck veins are distended and the liver is enlarged. Despite the presence of obvious mitral stenosis patients do not as a rule have a history of dyspnea or hemoptysis. Cardiac catheterization reveals an increase in right atrial pressure with normal right ventricular and pulmonary artery pressures.

The authors use the following surgical technique. The chest is opened through a left posterolateral incision in the fourth interspace. A longitudinal incision is made on the anterior surface of the pericardium 2 cm. anterior to the phrenic nerve. The mitral commissurotomy is done in the usual manner. The latter part of the procedure is done first in order to avoid loading the pulmonary circulation as would be the consequence if the tricuspid stenosis were managed initially. In order to reach the tricuspid valve the heart is rotated anteriorly and to the left by traction on the right leaf of the divided pericardium. The right auricle is then amputated and the finger introduced into the right atrium. The adhesions between the tricuspid leaflets are separated. Great care must be taken in order to avoid producing tricuspid insufficiency which is a much more serious lesion than tricuspid stenosis. Following closure of the right auricle the pericardium is loosely sutured.

The authors operated on 3 patients using this technique. Good results were obtained in 2 cases; the third patient died 80 days after the operation of failure of the right side of the heart. The postoperative course of the 3 patients was characterized by a marked dilatation of the right side of the heart with evidence of tricuspid insufficiency. The authors attribute this to the hemodynamic effects of the increased volume of blood reaching the right ventricle which produced ventricular dilatation and tricuspid insufficiency. This occurred in all 3 patients as evidenced by pulsating jugular veins. Three to six months following the operation, the right heart compensated by hypertrophy in the first 2 patients and the tricuspid insufficiency was no longer evident. On the other hand in the third patient who had had previous evidence of heart failure, the right side of the heart was not able to compensate for the increased load imposed upon it and failed. Double mitral and tricuspid commissurotomy is indicated only when the condition of the myocardium is good, when the patient is young, and when there are no disturbances of the cardiac rhythm.

With the evidence of cardiac, hepatic, or renal damage, the authors consider it unwise to attempt any more than a mitral commissurotomy. They underscore the fact that tricuspid stenosis can be tolerated fairly well for many years. If the patient derives sufficient benefit from the mitral commissurotomy, it may then be possible to deal with the problem of the tricuspid valve in a second stage.

—Rene B. Menguy, M.D.

Results of Open Heart Surgery with Elective Cardiac Arrest by means of Potassium Citrate in Patients with Congenital and Acquired Heart Disease. F. MASON SONES. *Dis. Chest*, 1958, 34: 299.

AFTER THE USUAL CANNULATIONS for maintenance of the circulation with the pump oxygenator, the heart is isolated from the systemic circulation by occlusion of the vena cavae and ascending aorta. Asystole is produced by injecting into the root of the aorta a solution of 25 per cent potassium citrate diluted one part to ten with blood. The solution rapidly perfuses the coronary circulation and arrest of cardiac activity persists until release of the aortic clamp permits the potassium citrate to be washed out of the coronary circulation by oxygenated blood from the pump oxygenator.

This method has achieved adequate surgical exposure of the cardiac chambers for as long as 60 minutes in 80 patients undergoing intracardiac surgery at the Cleveland Clinic Foundation. In no instance was death or surgical failure attributable to the use of cardiac arrest.

These 80 patients had a wide variety of congenital and acquired cardiac lesions. Forty-five of them survived. Deaths resulted from errors in diagnosis and in the selection of patients, preventable and inevitable surgical errors, failures in postoperative care, and on account of unsolved problems in total artificial perfusion. —*Lockert B. Mason, M.D.*

Effect of Competitive Industrial Activity on Severely Disabled Cardiac Patients. ALVIN SLIPYAN. *J. Am. M. Ass.*, 1958, 168: 147.

THE AUTHOR'S report on 19 employees, all of whom are classified as having severe or advanced heart disease, may be considered unique since never in the history of private industry has such a deliberate policy of employing the "unemployable" cardiac patients been carried out. The financial success of this enterprise is evidence of the productivity of these employees.

The maintenance of excellent attendance records, and not one reported case of compensable injury, is directly contrary to the stated reasons usually given by industry for not employing cardiac patients. The absence of any deterimental effect of employment on the disease state is well documented in the literature, and the remarkable improvement exhibited by some of the employees makes one wonder whether the dictum that the person with severe cardiac disease requires constant rest and should retire from employment should not be revised to this: Employment in a compatible job can, in the specific case, be beneficial. —*Robert Turell, M.D.*

ESOPHAGUS AND MEDIASTINUM

Congenital Atresia of Esophagus; Indications, Technique and Efficacy of Primary Radical Operation (Die kongenitale Oesaphagusatresie; Indikation, Methodik und Leistungsfaehigkeit der primaeren Radikaloperation). KURT SPOHN. *Langenbecks Arch. klin. Chir.*, 1958, 288: 526.

ATRESIA OF THE ESOPHAGUS is a malformation which is probably due to disproportion between epithelial proliferation and longitudinal growth. The following classification is the most practical one:

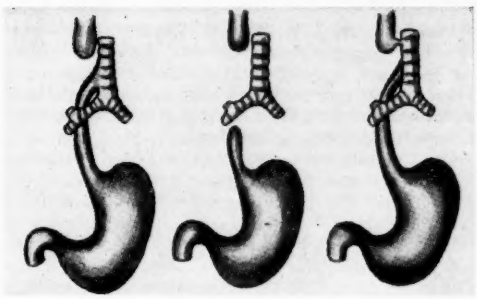


Fig. 1 (Spohn).

Type 1: no esophagus is present.

Type 2: both cranial and caudal portions are occluded.

Type 3a: there is a fistula between the cranial segment and the trachea or one of the main bronchi.

Type 3b: a fistula exists between the caudal segment and the trachea or one of the main bronchi.

Type 3c: both segments are connected through fistulous tracts with the trachea or one of the main bronchi.

Type 3b accounts for 88 per cent of all cases of atresia. The method of choice in the treatment of this condition is primary radical operation with severing and repair of the esophagotracheal fistula and end-to-end anastomosis of the esophagus.

Type 2 requires a primary gastrostomy for feeding purposes. In some instances a cervical esophagostomy must be added to allow escape of nasopharyngeal secretion and to avoid aspiration pneumonia. The final operation should be performed between the first and third year of life. Intrathoracic procedures, such as esophagogastrostomy, esophagojejunogastrostomy, or esophagocologastrostomy, appear preferable to antethoracic operation.

The main danger in atresias with a lower esophagotracheal fistula is the reflux of gastric secretions into the lungs, with resulting pneumonia. In atresias with a lower fistula gastrostomy for feeding purposes is absolutely contraindicated because experience shows that not only gastric secretion but also milk is aspirated by the lung.

Inasmuch as pneumonia is present in nearly every case but subsides postoperatively in a certain percentage of cases, it should not be considered a contraindication to operative treatment.

Cure may be expected in from 40 to 50 per cent of cases. The results cannot be improved because: (1) pneumonia caused by aspiration of gastric secretion frequently develops, (2) in numerous instances other grave malformations are present, and (3) approximately 60 per cent of the patients are premature.

Improvement of the results could be expected only from an earlier diagnosis which would allow the performance of a radical operation on the second or third postnatal day.

Rib resection is superfluous for the transpleural

approach. The author favors the telescoping stitch for the anastomosis. The pleura is closed without drainage. The gastric tube is withdrawn immediately after the operation, to avoid perforation of the gastric wall. The operation is performed on intubated patients under barbiturates, nitrous oxide or ether anesthesia, with the aid of succinyl choline.

Of 11 children who underwent a radical operation, 5, or 45 per cent survived.

—Joseph Narat, M.D.

On the Pathogenesis of Cardiospasm. P. ALNOR. *J. Thorac. Surg.*, 1958, 36: 1414.

THE CLINICAL PICTURE of swallowing difficulties, designated in 1881 by von Mikulicz as cardiospasm, is not associated with true spasm or any spastic condition of the esophagus. Achalasia, that is, failure of the cardiac orifice to open after all the reflex movements of deglutition have ended, is considered more nearly correct and preferable. Spasm of the esophagus is accompanied by hypermotility; achalasia, on the other hand, by hypomotility or even paralysis of the entire esophagus. One reason the nature of the disease is not well understood is insufficient knowledge concerning normal anatomy and physiology of the cardia.

The author describes experimental work in the rabbit and dog in which freezing of the cardia by the application of carbon dioxide snow was produced. The clinical picture of achalasia, with muscular hypertrophy of the esophageal wall and secondary dilatation of the esophagus proximal to the cardia was duplicated. Cicatricial stenosis was not found on the roentgenogram and the mucosa on autopsy examination was always intact.

The author believes, on the basis of experimental observations, that the first stage in the development of achalasia is impairment of circulation with consequent destruction of neural elements of the cardia. Histamine may be released in the cardiac region that is exposed to cold, resulting in protracted vasoconstriction. The ganglion cells of Auerbach's plexus are extremely sensitive to hypoxia and succumb readily. This produces a clinical picture of achalasia. He believes that there is in the region of the cardia no anatomical sphincter analogous to the pylorus or other sphincters, and closure of the esophagus is brought about by a number of factors including the angle at which the esophagus enters the stomach. Opening the cardia at the end of deglutition is brought about by vagal fibers extending from the nucleus pigmentosus and innervating the striated musculature of the upper third of the esophagus. These are not true parasympathetic fibers, but are analogous to the motor fibers of the vagus innervating the larynx. Their antagonist is not the sympathetic system but the neuromuscular system of the cardia itself which possesses significant tone even in the resting state. On irritation of the sympathetic system the tone of the cardia is increased and immediately decreases on termination of the irritation. Even after operation with removal of all sympathetic fibers cardiac function is still normal.

The author concludes with the following statement: achalasia appears to originate in Auerbach's plexus with typical degeneration of the ganglia and the mural layers of the cardia degenerate, probably gradually, until they reach the final stage of degeneration as cardiac sclerosis.

—Allan D. Callow, M.D.

Esophageal Webs: A Report of 58 Cases and an Attempt at Classification. MUNIR H. SHAMMA'A and EDWARD B. BENEDICT. *N. England J. M.*, 1958, 259: 378.

FIFTY-EIGHT CASES of esophageal-web formation are reported, with comments on the symptomatology, diagnosis, and therapy of the condition. A classification into four groups based on clinical, radiologic, and laboratory data is attempted. The groups are as follows: upper esophageal webs, with and without anemia; webs of the middle third of the esophagus; lower esophageal webs; and webs associated with benign mucous-membrane pemphigus.

The possible relationship between the presence of an esophageal web and buccal or esophageal carcinoma is noted.

—Benjamin Goldman, M.D.

Sliding Esophageal Hiatus Hernia; Manifestations, Pathophysiology, and Management. Findings in 100 Consecutive Cases. E. LEONARD POSEY, JR., SAMUEL L. STEPHENSON, JR., and F. EARL FYKE, JR. *South. M. J.*, 1958, 51: 809.

THE AUTHORS report 100 consecutive cases of sliding hiatus hernia from the University of Mississippi School of Medicine and the Veterans Administration Center. The authors classify hiatus hernias into several types.

1. Normal position of esophagogastric junction. (a) Paraesophageal hernia is uncommon.

2. Intermittent cephalad displacement of esophagogastric junction. (a) Concentric hernia (sliding type) is common. (b) Eccentric hernia (sliding plus paraesophageal type) is uncommon.

3. Permanent cephalad fixation of esophagogastric junction. (a) This is the shortening of the esophagus. (b) Congenitally short esophagus.

The present article is concerned only with hernias of the sliding type.

The presence of the hernia was established in each instance by means of x-ray. A sliding hiatus hernia was considered to be present if the esophagogastric junction could be observed to be displaced cephalad, if the pouch above the diaphragm contained irregular mucosal folds of the gastric type, and if retrograde filling of the pouch from the stomach was demonstrable. Esophagoscopy was not necessarily helpful in the authors' experience and they have failed to demonstrate any hernia by this means that had not already been disclosed by means of x-ray. They believe that it is chiefly an aid in diagnosing esophagitis.

The 100 sliding hernias were encountered in a series of 1,324 patients who had upper gastrointestinal roentgenograms.

The authors believe that it is important to note that apparently asymptomatic sliding hiatus hernias exist and 8 of their patients were found to have such a condition with pouches measuring up to 8 cm. in diameter. However, the authors state that symptom-free hernias should not be considered innocuous. Two of their patients had massive hemorrhages during the period in which they were traced.

Of the 100 patients ranging in age from 26 to 84,

the average age was 54.4 years. Sixty-eight sliding hernias were found in females, 38 in males. Associated or coexistent lesions were present in 47 patients. Duodenal ulcer was the most common, being present in 22 individuals, followed in frequency by sigmoid diverticulosis, cholelithiasis, duodenal diverticulum, pulsion epiphrenic esophageal diverticulum, and gastric ulcer.

The symptoms can be divided into 3 groups: (1) symptoms due to the hernia itself; (2) symptoms due to disordered esophageal motor function; and (3) those originating in associated esophagitis.

Symptoms due to abnormal esophageal motor function: Thirty-eight of the authors' patients complained of dysphagia, intermittent, of mild to moderate intensity, unassociated with demonstrable esophageal stenosis. The dysphagia appeared without any pattern, occurring sporadically at erratic intervals, or coming daily for a few days only to disappear. The nature of this type of dysphagia the authors believe implicates but does not prove an esophageal dysrhythmia as its genesis.

Symptoms due to the hernia itself: The emergence of a gastric pouch into the thoracic cavity may produce distress by purely mechanical means. Trapping of the hernia by the hiatal aperture with compression of the gastric tissue within the ring may give pain. Forty-seven of the authors' patients reported pain attributed to the mechanical effects of the hernia. Free regurgitation, either nocturnal or postprandial after overeating, is the other mechanical result of the hernia.

Symptoms due to esophagitis. In the experience of the authors, esophagitis manifests itself early as vague high epigastric dyspepsia appearing postprandially, occasionally associated with transient mild dysphagia and lower esophageal distress on swallowing. Heartburn appears later, with discomfort involving the entire esophagus. Pain, appreciated as steady, boring, and deep, may be localized to the distal esophagus or be referred more diffusely into the anterior thorax. Regurgitation of gastric contents is common. Eighty-four of the authors' patients reported esophagitic pain and symptoms.

Nausea. The most frequent complaint of the patients was nausea; it was present in 90 individuals. Of 16 patients who had been restudied over a period of 1 to 3 years following the initial diagnosis there was enlargement of the hernia in 25 per cent.

The authors discuss the literature and some of the factors that they believe important in the pathophysiology of the disease. They state that the distal esophagus is anchored to the diaphragmatic hiatus by the phrenoesophageal elastic membrane which inserts into the esophageal wall some 2 to 3 cm. above the hiatus. A narrowing at this point is spoken of by some as the inferior esophageal sphincter. A segment of the extreme lower esophagus, approximately 2 cm. in length and lying at the level of the hiatus, remains tonically constricted. Relaxation of this sphincteric structure occurs within 2 seconds after swallowing while the esophageal peristaltic wave is still high in the esophagus. The authors believe that their work indicates that this sphincter mechanism is a weak one and that normal positioning of the gastroesophageal junction at or below the diaphragmatic hiatus is a requisite for this to act as a competent barrier to reflux. Although the esophageal mucosa may be damaged by alkaline intestinal juices and bile, the organ is highly sensitive to the action of acid peptic juice. A number of barriers exist to the regurgitation of gastric juice: (1) inferior esophageal sphincter, (2) constrictor cardiae, (3) mucous membrane barrier, (4) oblique entry of esophagus into stomach, (5) flap-like valve produced by gastric air bubble, (6) sling effect of right crus of diaphragm, (7) snugging effect of phrenoesophageal ligament, and (8) tethering effect of left gastric artery. The authors state that current theories do not in their estimation explain all of the known facts regarding hiatus hernia and esophagitis.

Conservative therapy can effectively control the majority of patients provided severe complications have not developed prior to diagnosis, and provided the patient is willing to adhere to the necessary program indefinitely. The patient is advised to follow a bland, nonirritating diet, avoid excessively hot and cold food, and restrict the size of the meals. Fats which delay gastric emptying should be avoided and alcohol, coffee, and tobacco are forbidden. In the presence of definite esophagitis and/or motor dysrhythmia, especially in the face of significant narrowing of the distal esophagus, dilatations afford significant relief. Seventy-nine of the patients in the current series are under medical management and doing satisfactorily. Twenty-one patients have been operated upon without evidence of recurrence.

Several reproductions of roentgenograms which demonstrate the authors' point are included.

—Peter Dineen, M.D.

Cobalt-60 Beam Therapy in Carcinoma of the Esophagus. J. S. Lott and Ivan H. Smith. *Radiology*, 1958, 71: 321.

Between January, 1952 and December, 1956 a total of 68 patients with carcinoma of the esophagus were referred to the Ontario Cancer Foundation, London Clinic (London, Ontario, Canada) for opinion and treatment. Of these, 31 were treated radically, 28 were treated for palliation, and 9 were not treated or received incomplete treatment. Of the 31 treated radically, 6 had postcricoid carcinomas, 7 had carcinomas in the upper third of the esophagus, 13 in the middle third, and 5 in the lower third (one of these was an adenocarcinoma). The authors estimate that in 21 cases the disease was apparently confined to the esophagus. Twenty of the cases were judged on roentgenographic evidence to have lesions 5 centimeters or more in length.

In 27 of the 31 cases in which radical treatment was given, 4, 5, and 6 fields were used with 80 cm. source-to-skin distance, and plaster-of-Paris casts in beam localization and fixation. The remaining 4 cases were treated by circumaxial rotation therapy at 95 cm. source-to-tumor distance. At the present time the writers try to deliver a tumor dose of 6,000 to 6,500 roentgens in 4 to 4.5 weeks in the treatment of lesions in the cervical esophagus. In the thoracic esophagus, a tumor dose of 5,500 to 6,000 roentgens was delivered. With correction by transit dose measurements, which

make allowance for increase in dose at the esophagus as a result of passage of the beam with minimal absorption through pulmonary tissue, the dose amounts to 6,000 to 6,500 roentgens.

Treatment complications in the survivors have been few. One case of asymptomatic pulmonary fibrosis and one of mild stricture have been observed. Mediastinal fistula was seen in 4 cases as a fatal complication of treatment.

At the time of writing this report there were 7 patients alive and apparently free from disease for periods ranging from one to 5 years.

—*Bernard C. Gerber, M.D.*

MISCELLANEOUS

Hiatus Hernia (L'avenir de la hernie hiatale). H. MONGES, A. MONGES, C. DAHL, R. LE CLUYSE, M. BROMBART, and Others. *Acta gastroenter. belg.*, 1958, 21: 3.

THIS MONOGRAPH by several Belgian authors presents a summary of the anatomic, pathologic, etiologic, medical, radiologic, and surgical aspects of hiatal hernia.

In the chapter on anatomy four variations in arrangement of the hiatal crura are compared and what constitutes a normal size hiatus ring is described. On surgical exploration in 55 per cent of the cases it is impossible to place even one finger between the muscular structures of the hiatus and the esophagus, while in 35 per cent one finger, in 8 per cent two, and in 2 per cent three can be introduced. The esophagus is fixed to the diaphragm by the phrenoesophageal membrane which is the major attachment that prevents the esophagus from slipping into the thorax. The atrophy or relaxation of this ligament is considered by some of etiologic significance in the development of hiatal hernias and its reconstruction is essential in the sliding type. Gastroesophageal continence is conditioned by three factors, namely, the esophageal sphincter, a physiologic rather than anatomic entity, the valvular mechanism of the oblique esophagogastric junction, and the diaphragmatic action.

The changes in the intrathoracic and intra-abdominal pressures are of importance in the pathogenesis of hiatal hernia and gastroesophageal reflux. Using the Valsalva maneuver an earlier and more pronounced increase in intragastric than intraesophageal pressure was demonstrated. Measurements in hiatal hernia pouches revealed positive pressures as in the subdiaphragmatic stomach but with variation of pressures corresponding to intrathoracic pressures, a decrease during inspiration and an increase during expiration.

Many cases of hiatus hernia are asymptomatic and thus escape diagnosis. When pain sets in, reflux esophagitis or incarceration of the hernia is suggested. Occult hemorrhages may result only in the development of anemia or major hemorrhages may occur. Compression of the vasculature will cause mucosal congestion, edema, and superficial erosions; the other points of origin may be a chronic marginal ulceration or esophageal lacerations of the cardiac esophageal end as described by Mallory and Weiss.

The incidence of hiatal hernia is difficult to evaluate. On a mass population survey by gastroscopy and roentgenograms a large number of asymptomatic hernias would likely be discovered, but only patients with acute complications, such as incarcerations and hemorrhages, or patients with continuous and recurrent symptoms present indication for surgical therapy.

Radiologic techniques for the upper gastrointestinal tract have been perfected to such a degree that diagnosis and objective depiction of medical and surgical therapeutic results as well as that of development of hiatal hernias *de novo* is practical. A retrocardiac pocket of air, deviation of the epiphrenic esophageal segment to the right, an obtuse angle of His with gastric mucosal folds reaching into the hiatus, and a reduplication of the left or right cardiac margins are some of the radiologic findings that make one suspicious of a hiatal hernia. To differentiate a congenital short esophagus from a sliding hernia is almost impossible. True paraesophageal hernias are found only rarely, a combination of a paraesophageal and cardiothoracic hernia may develop with progressive enlargement. Radiologic evaluation is of importance in detecting esophageal reflux, marginal ulcerations, and traumatic ulcers of the lesser curvature; an unrecognized cancer of the gastric herniation may present considerable diagnostic difficulties.

The radiologist plays a role in the follow-up of patients. After a surgical procedure reflux and recurrent hernias must be detected; diverticular protrusions may be simulated by some surgical techniques, such as suture fixation of the base of the esophagus. An early postoperative radiologic follow-up is therefore essential.

The surgical correction of hiatus hernia should be conditioned by Harrington's dictum, "An esophageal hiatal hernia is primarily a mechanical condition and not a disease."

The transthoracic techniques of Sweet and Alisson, and the abdominal approach of Harrington are mentioned. Wangensteen's technique of thoracoabdominal approach with esophageal transposition into a new hiatus is compared to a similar operation, that of Finochietto for dysphagia due to a thoracic aneurysm. Boerma uses an abdominal approach and after excision of the peritoneal excess repairs the esophageal hiatus posterior to the esophagus. The cardiac end of the lesser curvature is fixed to the anterior abdominal wall and the greater curvature at the fundic end of the stomach is fixed to the diaphragm. The cardia, thus, is kept under tension and at a distance from the hiatus. The authors of this chapter, L. Deloyers and J. Van Der Stricht, subscribe to the Alisson technique with minor modification. They state that the only contraindication to thoracotomy is advanced age. Incision through the diaphragm and its secondary paralysis accentuate the esophagogastric angle, reconstituting thus the angle of His. In 16 cases in which suture of the esophagophrenic membrane and the crura was performed, one symptomatic and one asymptomatic recurrence were found.

In the concluding chapter the impression is voiced that surgical therapy is used in excess and that stricter indications for the selection of patients should be used. Anatomic recurrence rates of not more than 5 to 10

per cent should thus be achieved. Functional symptomatic postoperative elements well might be the result of false operative indications. For true recurrences repair through an abdominal approach such as that practiced by Boerma is suggested.

—*Karel B. Absolon, M.D.*

Dehiscence of the Stomach Through a Counter Incision in the Diaphragm following Repair of a Hiatus Hernia. JOHN M. KESHISHIAN and GEORGE J. MAGOVERN. *Ann. Surg.*, 1958, 148: 276.

TWO CASES are reported in which herniation of the stomach into the thorax occurred following an Allison repair of a diaphragmatic hernia.

In each case the herniation occurred as a result of a dehiscence of the counter incision made in the diaphragm. The diagnosis was made on the seventh day after the operation in the first case and on the eighth day in the second case by chest roentgenogram after a swallow of barium.

Both patients were operated upon a second time and the herniation of the stomach repaired. In the first case, a portion of the gastric wall of the herniated portion of the stomach was gangrenous and required resection.

The circulation of the stomach was not compromised in the second case.

—*Frederick W. Preston, M.D.*

Prescalene Lymph Node Biopsies. A Report of 142 Cases. DONALD B. ROCHLIN and HORATIO T. ENTERLINE. *Am. J. Surg.*, 1958, 96: 372.

PRESCALENE NODE BIOPSY has become a routine part of the evaluation of patients suspected of having bronchogenic carcinoma in some clinics. In many cases a diagnosis can be established by this means without thoracotomy and its attendant morbidity and mortality. The percentage of positive results reported varies from 25 to 60 per cent.

The lymphatic drainage of the lung must be apprehended in order to choose the correct side for biopsy. The right lung and right side of the mediastinum drain via the right scalene nodes and the right lymphatic duct. The basal segments of the left lower lobe also drain via the right lymphatic system, while the apical segments of the left upper lobe drain via the lymphatics of the left supraclavicular region. The inferior part of the upper left lobe and the superior part of the lower left lobe may drain toward either side.

The criteria used in the University of Pennsylvania Hospital for the selection of cases for prescalene node biopsy are (1) roentgen evidence of hilar and/or mediastinal enlargement not explained by the usual diagnostic procedures, (2) roentgen evidence of pulmonary infiltrates which appear to be either inflammatory or neoplastic, (3) determination of operability in primary pulmonary neoplasms, and (4) cultures of lymph node tissue for fungus and tuberculosis.

No patients who have palpable lymphadenopathy are included. All diagnoses are also confirmed by other evidence before statistical inclusion. There is some correlation between the size of the nodes, and the number of positive nodes, about 90 per cent of those over 1.0 cm. in diameter containing positive findings correlating with the pulmonary disease. This knowledge should prove useful to the surgeon pressed for an immediate verdict.

Positive biopsies were obtained from 45.8 per cent of the cases. Among 155 operations there were complications in 2.6 per cent of the cases from unrecognized transection of the right lymphatic duct, the thoracic duct, the phrenic nerve, and the cervical sympathetic chain.

The diseases diagnosed were bronchogenic carcinoma, sarcoidosis, tuberculosis, metastatic malignancy to the lung, lymphosarcoma, Hodgkin's disease, carcinoma of the esophagus, and anthracosilicosis. The percentage of positive diagnoses in each disease category was 40.7 for bronchogenic carcinoma, 79.4 for sarcoidosis, 30 for tuberculosis, 100 for lymphosarcoma, and 50 for Hodgkin's disease.

—*Carl H. Calman, M.D.*

Prescalene Lymph Node Biopsy. JOHN T. WILSON, EUGENE G. LAFORET, and JOHN W. STRIEDER. *N. England J. M.*, 1958, 259: 615.

A TOTAL of 153 consecutive prescalene lymph node biopsies was performed in a study of intrathoracic disease. A control series of 20 scalene node biopsies was also performed on patients with a tentative diagnosis of pulmonary tuberculosis. The frequency of positive disease, the significance of the negative report, and the value of node biopsy as a substitute for exploratory thoracotomy were assessed.

In 20 per cent of the cases (29), the histology of the prescalene node was found to reflect the underlying pulmonary disease, which was carcinoma, 23, sarcoidosis, 3, and tuberculosis, 3. In only 7 patients of this latter group, could the same diagnosis have been determined by bronchoscopic examination or by cytologic sputum study. In the remaining 22 patients it would have been possible to make the diagnosis only by exploratory thoracotomy. In 40 per cent (48 cases) the prescalene node biopsy was reported as negative, but a diagnosis was obtained by other means. Despite a negative node biopsy, in 33 patients with carcinoma of the lung the lesion was found to be inoperable at thoracotomy. In 17 per cent of the cases in which bronchoscopy and cytology failed, a positive diagnosis was obtained by prescalene node biopsy. In the control series, a histologic diagnosis of pulmonary tuberculosis was obtained in 2, a diagnosis of sarcoidosis in 3, and a diagnosis of bronchogenic carcinoma in two. The 13 other biopsies were negative. The overall statistics indicated that prescalene lymph node biopsy provided a histologic diagnosis in 39 per cent.

—*B. G. P. Shafiroff, M.D.*

The Neurogenic Intrathoracic Tumors (I tumori neurogenici intratoracici). F. COLOMBO, F. PISANI, and A. PERACCHIA. *Chirurgia*, 1958, 13: 1.

THE AUTHORS follow the Anderson and Ackerman classification of peripheral nerve tumors to present a review of those more frequently found in the thoracic cavity, as an introduction for their presentation of 4 cases of paravertebral neurinomas located in the thorax.

All of them were well encapsulated, yellowish-gray

in color; the microscopic examination revealed closely packed cells with nuclei in palisade formation standing out in the characteristic fibrillar background. There were also areas of degeneration with reticulin deposits and frequent dilated vessels with small hemorrhages. The authors used the Van Gieson and Mallory staining methods to identify the typical fibrillar compound from the collagen fibrils.

Clinically, these tumors are found in young patients; they grow very slowly and they are located more frequently in the paravertebral region but they can be found in any part of the thoracic cavity. They are silent tumors with few manifestations after a usually long latent period. Pain which follows the distribution of the intercostal nerve involved is the first symptom. Other symptoms are related to the localization of the neoplasm and the degree of compression of diverse organs. The principal diagnostic aid is the roentgen examination. Films in anteroposterior, lateral, and oblique projections will reveal the location of the tumor. Laminograms may also be of some help.

Finally, complete surgical excision is the treatment of choice, in view of the theoretically possible malignant evolution. —*Ruben Brochner, M.D.*

Intrathoracic Lipomas (Intrathorakale Lipome). H. Gremmel, F. Rotthoff, and K. H. Willmann. *Thoraxchirurgie*, 1958, 6: 75.

The authors, of the Surgical Department of the Medical Academy at Düsseldorf, Germany, review the literature on intrathoracic lipomas, which includes 107 cases, and report on 9 personally observed cases.

Intrathoracic lipomas may originate from any organ that contains adipose tissue. Cases are on record originating from the bronchotracheal system, the thymus, the heart, and the esophageal wall.

The so-called "hourglass lipomas" constitute a special group. They are partly extrathoracic and partly intrathoracic, especially in the cervical and diaphragmatic regions. In these tumors the two portions are usually connected by a narrow isthmus of tumor tissue. It is assumed that these lipomas originate from undifferentiated embryonal tissue. They are mostly found in pre-existing gaps of the thoracic wall.

Of the 9 cases observed by the authors 2 were located in the mediastinum, 6 in the diaphragmatic area, and 1 in the wall of the lower esophagus, extending through the hiatus into the abdominal space. Of the 6 lipomas in the diaphragmatic area 3 were "hour glass" tumors in the region of preformed gaps, and 2 were located over diaphragmatic hernias.

The symptomatology includes dyspnea, pain, and oppressive sensations in the chest, cough, and dysphagia. Intratracheal and intrabronchial lipomas may cause atelectasis. The periesophageal lipoma observed by the authors caused dysphagia and colicky pains in the epigastrium during meals. One patient was asymptomatic.

Rontgenologic visualization is sometimes difficult as the smaller lipomas are of low density and are sometimes semitranslucent. It is not possible to differentiate lipomas from other intrathoracic tumors either clinically or radiologically.

The therapy is extirpation. All of the authors' patients made an uneventful recovery after the operation. —*Werner M. Solmitz, M.D.*

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Mesenteric Infarction; A Clinical Study of 49 Cases. W. P. GOLDMAN. *Canad. M. Ass. J.*, 1958, 79: 547.

DESPITE THE great advances made in the treatment of intestinal obstruction and thromboembolic disease in the past two decades, there has been no appreciable reduction in the mortality due to mesenteric thrombosis.

A survey of admissions to the Vancouver General Hospital during the 10 year period 1947 to 1956 revealed 49 well documented cases.

The correct clinical diagnosis was made in only 35 per cent of these patients. Almost 80 per cent of them suffered from concomitant cardiovascular disease. The vascular occlusion was arterial in 75 per cent, venous in 20 per cent, mixed in 5 per cent. Arterial embolism accounted for 40 per cent of cases, whereas arterial thrombosis was the second most frequent type of occlusion, there being 34 per cent involved. Twenty-five per cent of patients had vague prodromal symptoms of several days' to several weeks' duration preceding the onset of infarction. An analysis of the presenting symptoms showed that these did not always conform to the dramatic qualities depicted in the classical description of the disease. Shock was a notable feature in less than one-third of cases, whereas in a few patients symptoms and signs were almost negligible, despite extensive infarction. In 20 per cent melena occurred, moreover, findings on scout roentgenograms failed to conform to any diagnostic pattern and a substantial proportion of cases developed during hospitalization for other diseases, usually cardiovascular. In these, only 27 per cent were correctly diagnosed clinically.

Operation was performed on 14 patients from 12 hours to 4 days after the onset of acute symptoms. Of the 2 patients who recovered, one was operated on 3 days and the other 12 hours after the onset. In 6 patients the operation consisted of exploratory laparotomy only. In 5, nothing further was done because of the extent of infarction (usually the entire small bowel and right colon). At laparotomy more information can be gained by palpating the main superior mesenteric artery for pulsations than from the appearance of the bowel. In the early stages of mesenteric arterial occlusion, the intestine may appear almost normal as to color and peristalsis.

No massive resections were performed. There are now many cases of massive bowel resection on record which indicate that 80 per cent or more of the small intestine can be sacrificed without producing serious nutritional disturbances in the patient. In this series the exact extent of infarction was noted in all cases at autopsy. In 10 patients there was sufficient non-infarcted bowel present to have permitted survival had operation been performed, other conditions being favorable.

Only 2 patients upon whom operation was performed received anticoagulants. However, reports in the literature of survival after mesenteric vascular occlusion treated by anticoagulants alone indicate that they are probably of considerable value.

—Stephen A. Zieman, M.D.

GASTROINTESTINAL TRACT

Endoscopy in Acute Upper Gastrointestinal Bleeding. DAVID KATZ, EMANUEL FRIEDMAN, and SYDNEY SELESNICK. *Am. J. Digest. Dis.*, 1958, 3: 734.

BY A MORE AGGRESSIVE diagnostic approach the number of undiagnosed cases of upper gastrointestinal hemorrhage may be reduced to a relative minimum with the use of endoscopy. The undiagnosed group of patients would primarily consist of those with an acute gastritis leading to hemorrhage, in whom endoscopy was delayed for 24 hours or more after bleeding. Moreover, the incidence of incorrect diagnoses, established solely by roentgenography, would be reduced. Finally, the presence or absence of bleeding varices is safely and correctly established rapidly.

The problem cases are those in which multiple diagnoses are suggested by clinical, laboratory, and roentgenographic means. In 7 cases, there was a history of alcoholism, a question of cirrhosis, and a history consistent with peptic ulcer. Three of these patients were bleeding from duodenal ulcers and one from a marginal ulcer. In all except one, the first clinical diagnosis was that of bleeding esophageal varices. In each case, the true source of bleeding was identified or the presence of varices was ruled out by endoscopy within 24 hours of admission to the hospital.

From the authors' experience it would seem that many patients are discharged from the hospital with diagnoses which do not really indicate the correct source of the upper gastrointestinal hemorrhage. Of the 18 problem cases, 2 were discharged without a satisfactory diagnosis; endoscopy was performed more than 72 hours after the bleeding episode. In one the diagnosis was presumptive only; gastroscopy was unsuccessful.

The high frequency of the diagnosis of ulcer in most series of bleeding should be stressed. It would serve no purpose to dispute the interpretation of the individual radiologist. Ulcer may indeed exist in 60 to 75 per cent of individuals with upper gastrointestinal bleeding, but it is most certainly not the source of bleeding in all of those individuals. Palmer has shown that although 50 per cent of a series of 238 gastrointestinal bleeders had ulcers, vigorous diagnostic methods revealed only 23 per cent of the entire group to be bleeding from a duodenal ulcer, and 13 per cent more to be bleeding from a gastric or stomal ulcer. Consequently 23 per cent of the original group who were demonstrated to have ulcers were bleeding from other sources.

The authors' series of diagnostic problems illustrate this point. Of 6 cases in which duodenal ulcer was diagnosed by roentgenography, 3 had the source of

bleeding elsewhere. In the seventh a roentgen diagnosis of gastric ulcer was found to be correct at operation.

A very helpful result of early endoscopy may be the negative examination. The absence of esophageal varices, other esophageal disease, or gastritis verified by endoscopy would mean that, in the event emergency surgery were required, a gastrectomy would to all intents and purposes cure all those patients not suffering from a blood dyscrasia. It would also mean the prevention of the indiscriminate use of esophageal balloons for tamponade. Balloons, in themselves, are not harmless, and not infrequently have catastrophic results in cirrhotics bleeding from ulcer.

Mention must be made of the poor correlation of the clinician's diagnosis with the actual diagnosis in problem cases of upper gastrointestinal bleeding. Of the authors' 18 difficult problems, only 7 were correctly diagnosed clinically.

The reluctance to adopt endoscopy as a routine procedure universally stems from fear. The authors' experience in esophagoscopy utilizing the flexible Eder-Hufford instrument at the Veteran's Administration Hospital, West Haven, Connecticut encompasses over 450 examinations, with no morbidity of any sort.

—Charles Baron, M.D.

Surgical Treatment of Gastric Ulcer in the Vicinity of the Cardia. STEN WALLENSTEN. *Acta. chir. scand.*, 1958, 115: 263.

THIS REPORT gives the results of high gastric resection for gastric ulcer in the cardial region performed at the Serafimerlasarettet (Sweden) from 1934 to 1956. Patients were included who had an ulcer either in the cardia or with its upper border not more than 3 cm. from the cardia on the lesser curvature. Most patients were in the later decades of life. There were 28 men and 12 women.

Eleven of the 40 patients had clinical histories suggestive of carcinoma and of less than one year's duration.

Thirty-eight patients were treated by partial gastrectomy with gastroduodenostomy or gastrojejunostomy. In cases in which the ulcer penetrated into the pancreas, the ulcer base was left in situ. In all other cases, the ulcer was removed. One patient had a total gastrectomy for an ulcer that on gross inspection appeared to be malignant. In one patient, a proximal resection with esophagogastrectomy was performed.

There were 5 postoperative deaths (12.5 per cent). Two patients died of shock, one each from pancreatitis, pneumonia, and pulmonary embolism.

Nonfatal complications included breakdown of suture line (one case), stricture of anastomosis (one case), minor pulmonary complications (6 cases), rupture of abdominal incision (one case), and infection of wound (one case).

Of the patients operated upon prior to 1950, there are 10 with adequate follow-up that have been recently examined by the author. Only one has anemia (the patient with total gastrectomy). There are no recurrent ulcers. The dumping syndrome in this group is the same as in other routine Billroth II resection patients.

—Frederick W. Preston, M.D.

Management of Perforated Peptic Ulcer. CLARENCE J. BERNE and WILLIAM P. MIKKELSEN. *Surgery*, 1958, 44: 591.

SIMPLE SUTURE CLOSURE of the perforation is the standard method of treatment in perforation of a gastroduodenal peptic ulcer. It affords positive control of the perforation and confirmation of the diagnosis. Mortality is low if hypovolemic shock is corrected preoperatively and if the patient is not moribund.

Continuous gastric aspiration has been advocated by others for treatment of perforated peptic ulcer. Good results have been reported, especially in young individuals with acute rather than chronic ulcers. "The method requires great diagnostic judgment, skill, and a very large amount of continuous observation by the attending staff." There is a need for a method of differentiating the acute self-sealing ulcer with good long term prognosis from the chronic ulcer which probably will require later definitive operation. In the former, gastric suction would be the treatment of choice.

In selected patients, definitive surgery for the ulcer diathesis may be done at the time of treatment for acute perforation. Since most patients with acute ulcer will remain well after control of the perforation, definitive procedures should be reserved for those in whom the history or operative findings indicate chronicity. Further, if definitive operation is done, the perforation must be of short duration, the patient must be in good condition, and operating conditions optimal. The authors prefer pyloroplasty and vagotomy to subtotal gastrectomy under these conditions. Gastrectomy is preferred in perforated gastric ulcers.

At the University of Southern California there was a 10.9 per cent mortality from 1940 to 1958 in patients treated surgically for perforated peptic ulcer. If the patients who were more than 60 years of age are excluded the mortality rate was 4 per cent.

—Lockert B. Mason, M.D.

Long Term Results in Surgical Treatment of Peptic Ulcer. E. C. PALLETTE and R. W. HARRINGTON. *J. Am. M. Ass.*, 1958, 168: 20.

A 10 YEAR FOLLOW-UP study of 519 patients having 538 definitive surgical procedures for peptic ulcer is presented. There were 379 patients with duodenal ulcer, 81 with gastric ulcer, and 29 with both duodenal and gastric ulcers. Eighteen had channel ulcers, and 31 had stomal ulcers. The operations were done in a 250 bed general hospital by 17 surgeons.

The long term results obtained by orthodox gastric resection, vagotomy and gastrojejunostomy, vagotomy and pyloroplasty, and vagotomy and conservative gastric resection are compared. Stomal ulcer was found to occur with equal frequency after gastrectomy for both gastric and duodenal ulcer.

The largest group of patients (207) had duodenal ulcer and they were treated by gastric resection. Most of these had a Billroth II gastrojejunostomy, some anterior and some posterior to the colon in about equal ratio. The Billroth I operation was utilized in about 10 per cent of these patients. There appeared to be no significant correlation between the type of gastric resection and the immediate long term results obtained. Postoperative deaths occurred

in 6.2 per cent and complications during surgery occurred in 2.4 per cent: injury to the common duct (2 patients), cardiac arrest (one patient), laryngospasm requiring tracheotomy (one patient), and hemorrhage (one patient). The immediate postoperative complications, which occurred in 28 per cent of the patients, consisted of leakage of the duodenal stump (7 patients), duodenal fistula (3 patients), pancreatitis (4 patients), hemorrhage (8 patients), obstruction of stoma (16 patients), wound dehiscence (5 patients), leakage of anastomosis (1 patient), pulmonary embolism (4 patients), and myocardial infarction (1 patient). Later complications representing long term failure of treatment occurred in 7.7 per cent.

Thirty-four patients had vagotomy and gastric resection with a 3 per cent mortality, and a 14.7 per cent incidence of immediate postoperative complications. The fact that this combination of procedures had a lower mortality and fewer complications than gastric resection alone for duodenal ulcer is attributed to the superiority of the ability of the few surgeons performing the procedure. There were no recurrences of ulcers or stomal ulcers in this group.

Thirty-seven patients had gastroenterostomy alone. The average age of this group was 60 years. There was one postoperative death (2.7 per cent). Immediate postoperative complications occurred in 3 (8 per cent), and recurrence of ulcer in 11 (30 per cent).

There was a lower mortality for gastric resection for gastric ulcer than for duodenal ulcer. Sixty-seven patients had gastric resection for gastric ulcer with an operative mortality of 1.5 per cent. The low mortality can be attributed to the comparative simplicity of the technical handling of the uninvolved duodenum.

Other procedures were not done often enough to permit evaluation.

On the basis of the material presented, the authors conclude that the surgical procedure which offers the peptic ulcer patient the best chance for a long term "cure" is gastric resection combined with vagotomy. —*Frederick W. Preston, M.D.*

A Pathologic and Clinical Study of Primary Reticulum Cell Sarcomas of the Stomach (Contributo allo studio anatomo-clinico del reticolosarcoma primitivo dello stomaco). P. CARBONERA, E. DE NICOLAI, and C. VIVORI. *Arch. ital. mal. app. diger.*, 1958, 24: 339.

THE AUTHORS review 6 personally observed cases of primary reticulum cell sarcoma of the stomach. Five of the patients were operated upon and the sixth patient was found to have the tumor at autopsy. In 4 cases the tumor developed within the lumen of the stomach whereas in 2 of the cases the growth was mainly extramural. Reticulum cell sarcomas of the stomach usually originate in the submucosa, particularly in the midportion of the stomach, and have a tendency to grow intraluminally. The tumors are bulky and frequently ulcerated. Histologically, the tumors are characterized by a polymorphous appearance with varying degrees of differentiation from field to field. There is very little fibroplasia. The metastases occur in the regional lymph nodes. There is no evidence that lymphomatous tumors of the stomach can originate from reticulum cell sarcomas. The authors believe that these two types of tumors should be classified separately since lymphomas are characteristically very radiosensitive whereas reticulum cell sarcomas of the stomach are very radioresistant.

Reticulum cell sarcomas of the stomach seem to occur more frequently in males, with a maximum incidence in the fifth decade. The symptomatology is nonspecific. Radiologically, the appearance of these tumors is also nonspecific and there are no special characteristics to help one differentiate them from ordinary adenocarcinomas of the stomach. The prognosis is no better than that of the usual adenocarcinoma of the stomach.

Of the 5 patients upon whom the authors performed resection, 2 patients were alive and well 3 years after the operation. The 3 other patients died of metastases within the first year following the operation. As mentioned previously, these tumors are radioresistant. Therefore the ideal method of treatment is gastric resection. —*René B. Menguy, M.D.*

The Efficacy of Cecostomy in Selected Cases of Paralytic Ileus. B. NOLAND CARTER II. *Virginia M. Month.*, 1958, 85: 491.

CECOSTOMY is useful in selected cases of paralytic ileus to prevent diastatic rupture of the cecum. Indications for cecostomy are progressive enlargement of the cecum demonstrated on daily roentgenograms, failure of decompression of the cecum by intubation and drug therapy, and duration of the cecal distention over those days, with the widest diameter of the cecum measuring 12 cm. or more by roentgenogram (focal length 40 inches).

Five cases are presented. The etiology of the paralytic ileus was varied and each patient met the criteria for cecostomy. The diameter of the cecum by roentgenogram was 12 to 21 cm. In 2 cases small areas of gangrene were noted in the cecal wall, one of which ruptured during the operation. In another a tear of the serosa of the anterior taenia was found. In the remaining 2 cases the cecum was thin and dusky in color.

The cecostomies were done under local anesthesia. At the time of the procedure partial decompression was done. Results were good in all cases although 2 of the patients subsequently died of causes which were not related to the operative procedure.

—*Lockert B. Mason, M.D.*

Chronic Midgut Ischemia. G. E. MAVOR and WM. MICHIE. *Brit. M. J.*, 1958, 2: 534.

THE AUTHORS believe that atherosclerotic narrowing of the superior mesenteric artery may produce chronic symptoms variously referred to as intermittent mesenteric claudication or abdominal angina. They believe that abdominal pain, altered bowel habits, and weight loss comprise a triad of symptoms characteristic of chronic midgut ischemia. To these can be added the presence of occult blood in the stools and the development of malabsorption.

The outstanding feature of the abdominal pain is its constancy. Although initially it may be intermittent, it soon becomes persistent and is present every day. It increases greatly after meals, particu-

larly after heavy ones. Inasmuch as insufficiency of the superior mesenteric artery may possibly be dealt with surgically, in a similar fashion to atherosclerotic involvement of other arteries, the authors believe that when narrowing or occlusion of the superior mesenteric artery is suspected, direct surgery should be undertaken. Failure to do so may lead to extensive bowel infarction. Two case histories are presented in which necrosis of the small and large bowel was found at autopsy presumably caused by insufficiency of the superior mesenteric artery.

—John H. Schneewind, M.D.

Regional Enteritis; Clinical Aspects and Diagnosis in 100 Patients. JOHN E. DAFFNER and CHARLES H. BROWN. *Ann. Int. M.*, 1958, 49: 580.

THE AUTHORS present a series of 100 patients with regional ileitis seen at the Cleveland Clinic from 1946 to 1956. The specific cause is unknown. The diagnosis of regional enteritis may be made earlier in its course with greater awareness of the signs and symptoms. The presence of only one of the typical symptoms or signs should indicate the possible presence of the disease. Fifty-five per cent of the patients in this series were less than 31 years of age, 15 per cent were more than 50 years. Symptoms which may be mild at the beginning may cause the disease to be present for a long time before a diagnosis is made. The average duration of symptoms is 2.9 years. The chief symptoms found in this series of patients were colic and abdominal pain (88 patients), diarrhea (81), loss of weight (70), gastrointestinal bleeding (34), draining sinus (33), fever (32), and fistula-in-ano (14). Physical examination revealed fistulas in 48 patients, an abdominal mass in 35, signs and symptoms of partial obstruction of the small intestine in 30, and abscesses in 15. The ileum was involved in 98 patients. Systemic complications were not so frequent as in ulcerative colitis and these subsided with adequate treatment of the underlying disease.

The authors advise that the roentgen examination of these patients should include a flat plate of the abdomen followed by barium enema studies. Motility studies of the small intestine may be done to determine the degree and extent of the disease. The onset of regional enteritis frequently consisted of occasional attacks of diarrhea, fever, or formation of fistulas in the abdominal wall or around the rectum. Occasionally symptoms started after gastrointestinal "flu" or a dietary indiscretion.

—Allan D. Callow, M.D.

Regional Enteritis; Results of Medical and Surgical Treatment in 100 Patients. CHARLES H. BROWN and JOHN E. DAFFNER. *Ann. Int. M.*, 1958, 49: 595.

THE RESULTS of treatment in 100 patients seen at the Cleveland Clinic in 1946 through 1956 are reviewed. Thirty-five of these patients received only medical treatment and 65 underwent operation. The response to treatment was classified as follows: good—return to normal activity with no diarrhea or other symptoms; fair—continuation of regular occupation with moderate limitation of activity and infrequent recurrence of symptoms; and poor—frequent and disabling recurrence of the symptoms. Medical treatment consisted of a low residue, low fat diet, high in proteins, carbohydrates, and vitamins. High residue foods which might cause obstruction were avoided and the diet supplemented with protein feedings and large doses of vitamins, particularly B complex. Mild sedation was given to aid the patient in obtaining needed rest and antispasmodics or anticholinergic drugs were given to decrease intestinal motility. Superficial psychotherapy was given by a gastroenterologist, but intensive psychiatric treatment was not used. A nonabsorbable sulphur preparation was prescribed for most patients. Of the 35 patients treated medically 23 had a satisfactory response, 3 an unsatisfactory response, and 9 were traced for less than one year. Specific aspects of the medical program are difficult to establish because multiple agents were used simultaneously. It is the conclusion of the authors that antibiotics (terramycin in 4 and streptomycin in 5 patients) were beneficial; steroid therapy was of benefit in 5 of 10 patients and roentgen therapy was of value in 3 of 6 patients. It is believed that medical therapy can be of benefit in patients with regional enteritis who have no severe surgical complications.

Indications for surgical treatment consisted of obstruction in 30, fistulas in 25, abscesses in 13, and severe anemia or hemorrhage in 9. Most patients with severe disease and complications underwent resection and the over-all results for operation are encouraging. Statistical comparison of the results of the resection with those of any other procedure are not considered valid because of the small sampling, but it is important to consider that many of the patients who underwent resection had more severe complication than those who underwent ileocolostomy with exclusion. After resection good results were obtained in 20 patients (71 per cent) and fair results in 3 (11 per cent) of 28 patients who were traced. After ileocolostomy with exclusion good results were obtained in 7 (50 per cent) and fair results in 5 (36 per cent) of 14 patients who were traced. Ileocolostomy without occlusion produced poor results. Six of 7 patients had a recurrence and the authors believe that this operation should no longer be performed for regional enteritis.

The site of recurrence is usually the site of anastomosis and in the small intestine immediately proximal to the anastomosis. It is recommended that the anastomosis should be made with small intestine that is normal both on gross and microscopic examination, for it was found in several cases that small intestine which appeared grossly normal proved to be involved on frozen section examination. The postoperative recurrence rate was high: 63 per cent for the entire group. The rate was lowest (54 per cent) in those patients who underwent resection and highest (6 of 7 patients) in those who underwent ileocolostomy without exclusion. Twenty-nine of the 38 patients in whom the disease recurred had their recurrence within 2 years of operation. In 18 of the 38 patients medical therapy was utilized for recurrence with satisfactory response in all. The remaining 20 patients underwent another operation: resection in 18 and ileocolostomy in 2. Two of the 38 patients were lost

to follow-up. Thirty-one of the remaining 36 patients responded satisfactorily to further treatment. The authors believe that results of treatment in these 100 patients warrant an optimistic approach to the problem. —*Allan D. Callow, M.D.*

Surgical Management of Complicated Diverticulitis. BENTLEY P. COLCOCK. *N. England J. M.*, 1958, 259: 570.

AT THE LAHEY CLINIC, during the past 10 years, 131 patients were operated upon for diverticulitis. There were 2 deaths, a mortality of 1.5 per cent. A one-stage intestinal resection with a primary anastomosis was performed on 69 patients (52.6 per cent) without a death.

The author believes that further reduction in the morbidity associated with this disease must come from earlier operation. He states that patients with relatively uncomplicated diverticulitis may be subjected to definitive surgery with a single operative procedure, a short period in the hospital, and a low mortality. Resection of the diseased bowel stops the recurrent attacks; perforation, obstruction, and formation of fistula are avoided, and the danger of allowing unsuspected carcinoma to go untreated is eliminated.

—*Robert Turell, M.D.*

Vagotomy for Bleeding Duodenal Ulcer. HOWARD E. DORTON. *J. Kentucky M. Ass.*, 1958, 56: 855.

THE AUTHORS report on 60 patients with bleeding duodenal ulcers who were treated by vagotomy combined with pyloroplasty. In performing the pyloroplasty the ulcer-bearing area was opened lengthwise by cutting across the pylorus. If possible, the ulcer was excised or excluded by wedge pyloroplasty or sutured to control or prevent subsequent bleeding. In this series 5 patients were subjected to a gastroenterostomy in addition to pyloroplasty because of marked reaction and edema at the ulcer site. The results of this series included one surgical death and four other failures, two of which had recurrent bleeding. Two patients who obtained good results died of unrelated causes. Fifty-two of 57 treated and traced patients obtained satisfactory results, a percentage of 91.2. The entire group had an average follow-up of 3.7 years. The authors believe that vagus section and pyloroplasty will tend to bring more patients to operation sooner by eliminating the reluctance of the patient and physician alike to consider performance of gastrectomy.

—*John H. Schneewind, M.D.*

Primary Carcinoma of the Jejunum. CHESTER CASSEL and HAROLD M. UNGER. *Am. J. Digest. Dis.*, 1958, 3: 669.

MALIGNANT LESIONS of the small bowel are often overlooked because of the relative infrequency of tumors in this area. Approximately 1 per cent of gastrointestinal cancers arise in the small intestine. Their onset is usually insidious, with pain being the usual late presenting symptom. Typical peptic ulcer symptoms are lacking, although pain is sometimes increased after heavy meals. Pain may result from obstruction or involvement of the parietal peritoneum. Epigastric fullness, bloating, and heaviness are other frequent complaints. Constipation may develop, and vomiting usually increases in frequency and severity. Stenosis must be nearly complete before obstruction occurs. Bile in the vomitus localizes the lesion as distal to the ampulla of Vater. Melena is rarely seen, although chronic occult blood loss may cause profound anemia and weakness. An abdominal mass may be felt, but was found in only 1 of 7 patients in this series.

Cytologic techniques of diagnosis have limited value. An erect scout film of the abdomen may reveal distended loops of bowel with fluid levels, and possibly gastric dilatation. Special x-ray techniques have been described, such as introduction of barium through a long tube passed down to the site of obstruction. The barium may then be aspirated. Of greater importance is the demonstration of early lesions by barium study before obstruction develops. Carcinoma is found more frequently than sarcoma in the jejunum, while the reverse is true in the ileum. Gross characteristics are quite variable, as is the degree of anaplasia. Lymph node metastases are found in 20 to 80 per cent of the resected specimens. If the intestinal lesion is ascertained to be a primary growth, radical segmental resection including adjacent mesentery must be performed. End-to-side anastomosis of the bowel after resection may be necessitated by incompatibility of the two lumens. Postoperative radiation is rarely helpful. Operative mortality has been reduced to 15 to 20 per cent, but the average 5 year cure is only 20 to 25 per cent, with survival in most cases being less than 3 years.

This report describes a series of 7 patients ranging in age from 46 to 74 years, all of whom were treated surgically for carcinoma of the jejunum. Four patients were women. Case reports are included. Two patients have survived and are well 16 and 20 months following operation. In the latter case, no involved lymph nodes were found at operation. The authors stress the late development of symptoms, such as pain, vomiting, and anemia. A plea for greater awareness and more careful gastrointestinal roentgenographic study is made. The possible usefulness of the "second look" operation in the follow-up of patients treated surgically for jejunal carcinoma is also suggested.

—*Emile L. Meine, Jr., M.D.*

Imperforate Anus. R. RANDOLPH BRANHAM. *Surgery*, 1958, 44: 578.

A BRIEF DESCRIPTION of the embryology and classification of imperforate anus precedes the analysis of the clinical cases of this anomaly seen at the University of Michigan Hospital between 1931 and 1955. There was a total of 130 such cases. Eighty-three (64 per cent) of this group had an associated fistula. Nine of the 23 patients with a Type 2 anomaly and 74 with a Type 3 anomaly had such fistulas. In the male patients these fistulas were evenly distributed between rectoperineal, rectovesical, and rectourethral types. There were 27 fistulas with 9 of each type. Of the 57 fistulas occurring in females, 23 were rectoperineal, 32 rectovaginal, and 2 rectovesical. It is of interest that 62 or 48 per cent of the 130 patients had at least one other anomaly. A considerable number of these patients had multiple anomalies. Nine patients had associated congenital heart defects and 8 had tracheoesophageal fistulas.

The importance of a careful preoperative evaluation of the anatomic situation in a Type 3 imperforate anus is emphasized. The use of roentgenograms in this connection, particularly the roentgenograms taken with the infant in the inverted position, is most helpful in determining the distance between the perineal skin and the rectal pouch. In those cases in which the pouch is within 1.5 cm. of the anal skin, perineal anoplasty is the preferred technique. On the other hand, if the blind end of the pouch is more than 1.5 cm. from the perineal skin, a combined abdominoperineal operation should be used. Transverse colostomy rather than a definitive anoplasty should be done in infants weighing less than 6 pounds at birth, those with other serious anomalies, or those whose general condition in the neonatal period is poor.

The cases of 43 patients treated from 1950 to 1955 are analyzed. Eight of these patients had an operative procedure done prior to admission to the University of Michigan Hospital. In 19 cases a perineal anoplasty only was performed, in 11 a colostomy only was performed, and in 2 an abdominoperineal repair was performed. In 2 others an abdominoperineal repair and a colostomy were performed, in one case a perineal repair and colostomy were performed, and in the remaining 8 no operation was performed. There were 14 deaths in these 43 cases. Thirteen were in patients with other severe congenital anomalies, and in each of these cases the cause of death was attributable to the other anomaly. There was only one death directly associated with an imperforate anus alone, and this was in a patient with a Type 3 anomaly and a rectourinary tract fistula in whom an unsuccessful attempt at repair had been performed prior to admission. Of the 25 survivors there were 19 with a satisfactory result and 3 in whom the result was classified as unsatisfactory. In the remaining 3 a colostomy only had been performed, and definitive treatment had not as yet been done. The importance of early adequate treatment is emphasized by the fact that all 3 unsatisfactory results were complicated by unsuccessful attempts at correction prior to admission.

—*E. Thomas Boles, Jr., M.D.*

LIVER, GALLBLADDER, PANCREAS, AND SPLEEN

Extrahepatic Biliary Tract Disease as a Long Term Result of Gastric Resection (Alterazioni delle vie biliari extraepatiche negli esiti a distanza della resezione gastrica per ulcera). A. Pulin, P. Bellinazzo, and G. Riquier. *Chirurgia*, 1958, 13: 89.

The analysis of 1,067 gastric resections for gastric or duodenal ulcers and 1,060 surgical procedures on the extrahepatic biliary tract performed over a period of 12 years and 9 months reveals that in 22 cases gastric resection preceded from 1 to 18 years the appearance of biliary tract disease. This number of cases represented an incidence of 2 per cent; other workers who have been interested in the problem have reported 1.3 per cent and 3.3 per cent.

All the patients whose cases are reviewed in the article were considered to have a normal biliary tract at the time of the gastrectomy. Several factors acting together are responsible for this relatively rare complication. Gastrectomy produces a loss of several branches of the vagus, mainly those which follow the lesser curvature of the stomach. Dislocation and kinking of the biliary system have been found after Billroth I gastrectomies. Alteration of the amount of cholecystokinin with modification of the normal hormonal mechanism of biliary tract evacuation comes as a result of the intestinal transit alteration when other methods for gastrectomy are used.

All these elements synergically bring about a hypotonic condition of the biliary system with slow flow and delay in evacuation and if an inflammation of the ampulla of Vater is added, all the circumstances for an acute or chronic disease are present. It is evident that most of the patients compensate for the hypotonic condition.

It is the authors' conclusion that even if these complications are rare, further evaluation will be of value, especially in relation to the diverse methods of gastrectomy.

—*Ruben Brochner, M.D.*

Repair of Cicatricial Stenosis of the Biliary Tree (Reinterventi sulla via biliare per stenosi cicatriziale dell'epatico). P. Bellinazzo, D. Galmarini, and U. Di Francesco. *Chirurgia*, 1958, 13: 171.

The authors report on 9 patients who were treated at the Surgical Clinic of the University of Milan. In 8 cases the stenosis followed a previous cholecystectomy and in one case the stenosis followed a gastroduodenal resection. The stenosis was total and extensive in 6 cases and partial in the remaining 3. There were 2 external biliary fistulas and one internal fistula.

In 4 patients an end-to-end repair was accomplished according to the technique of Lahey and Cattel. An anastomosis between the hepatic ducts and the duodenum was accomplished in a fifth case. In the remaining 4 patients an anastomosis between the hepatic ducts and an isolated segment of jejunum was carried out, using the Roux principle.

In 2 patients treated by an end-to-end anastomosis there was a recurrence of symptoms and a second operation was necessary. In both of these the Roux type of repair was performed.

Satisfactory results were obtained in all patients. One patient showed a subicteric tinge at the end of one year which was considered to be caused by an accompanying cirrhosis of the liver manifested by a rigid biliary tree, which was revealed by a cholangiogram taken through a T tube. The biliary passages in this patient were considered to be open.

The authors conclude that the type of repair should not be standardized and should be adapted to the findings at operation. They do believe that the hepaticojejunostomy, using a Roux type loop, is the most applicable and is especially recommended after the failure of an end-to-end anastomosis.

—*Lucian J. Fronduti, M.D.*

Primary Carcinoma of the Liver; A Pathologic Study of 14 Cases. Manuel D. Peñas, Augusto J. Ramos, and Francisco J. Roman. *Philippine J. Cancer*, 1958, 2: 27.

Primary carcinoma of the liver is not a rare neoplasm if its incidence among the colored races and

orientals, particularly the rice eating peoples, is considered. The authors present the case histories and a pathologic study of 14 cases of primary carcinoma of the liver gathered from 931 autopsies performed during the period from 1946 to 1951 at the Department of Pathology of the University of Santo Tomas, The Philippines.

Metastatic tumors involving the liver were carefully screened and excluded. Grossly, the cases were classified according to Eggel's criteria into three types: the nodular, massive, and diffuse forms. In the nodular form, there are nodules of tumor varying in size from a few millimeters to several centimeters in diameter, in large or small numbers, well defined, and with little or no compression of the surrounding liver parenchyma. In the massive form, the tumor is a large mass which may occupy an entire lobe, usually the right, is poorly defined and accompanied by smaller satellite nodules. In the diffuse form, there are widespread tiny nodules often no larger than a lobule, each enclosed in a connective tissue band. Often, carcinoma can only be determined microscopically.

All cases occurred in males, the oldest was 78 years and the youngest was 32 years; the average age in this series being 50.9 years. However, more cases were encountered in the 31 to 40 age group. The nodular and massive types occurred with equal frequency. The diffuse type was not encountered and the most frequent cause of death was exsanguinating hemorrhage due to rupture of a carcinomatous lobe. Hepatic insufficiency was next and death from hemorrhage due to rupture of esophageal varices was the least frequent. —*Stephen A. Zieman, M.D.*

Congenital Absence of the Gallbladder and Cystic Duct. BERNARD PINES and DAVID M. GRAYZEL. *Arch. Surg.*, 1958, 77:171.

CONGENITAL ANOMALIES of the gallbladder and biliary tract occur in approximately 10 per cent of autopsies. While many of the congenital variations are of no clinical significance, some may be responsible for pathologic changes in the bile ducts which in turn predispose to inflammation and stone formation. Congenital absence of the gallbladder and cystic duct in the presence of a normal hepatic and common duct system is a rare anomaly of the biliary tract. It is usually encountered during laparotomy in patients with symptoms of biliary tract disease.

Five cases covering a span of 27 years are reported in this paper. Four of the cases were incidental findings at autopsy and one case was discovered at the time of laparotomy for biliary tract symptoms.

The incidence of agenesis of the gallbladder ranges from .03 to .06 per cent, and the sex distribution appears to be about equal.

The disease has been observed in patients from under one year of age to those in the advanced age groups. Of the 5 patients studied in this report, the youngest was 21 months and the oldest was 83 years.

The etiology of the condition remains unknown; however, it is believed that it is a result of a disturbance of embryonal development.

Absence of the gallbladder may be associated with other congenital anomalies; however, there does not appear to be any specific anomaly with which it is usually associated. It has been described with the anomalies of the common bile duct, pancreas, stomach, ears, palate, spleen, and has been accompanied by megacolon and imperforate anus.

There has been a controversy as to whether or not congenital absence of the gallbladder creates abnormalities of the common bile duct or the ducts in the liver. There is evidence that dilatation of the extrahepatic biliary tree does occur in 30 to 40 per cent of the patients with agenesis of the gallbladder. It is believed that this is similar to the change in the ductal system which has been described following cholecystectomy. Mann has theorized that in the absence of the gallbladder there is ampullary dysfunction followed by bile stasis and dilatation of the bile ducts. This may precipitate stone formation and he actually noted common duct stones in 13 patients who were treated surgically. Villareal noted common duct stones in 13 of 37 patients treated for agenesis of the gallbladder. Certain other changes in the liver and pancreas may be found accompanying agenesis of the gallbladder. Dixon and Lichtman reported the presence of chronic pancreatitis in 21 per cent and cirrhosis of the liver in 21 per cent of the 60 cases that they reviewed.

Of the 4 patients in this present series whose condition was found at autopsy, 2 showed concomitant cysts of the kidney and the third had a renal hamartoma. Two of the patients had duodenal ulcers.

The symptoms of this disease are similar to the symptoms of cholecystitis and cholelithiasis. The symptoms are usually corroborated by cholecystographic study which reports nonfunctioning or nonvisualization of the gallbladder. Approximately 50 per cent of the cases will have an associated clinical icterus. There is nothing specific about this set of symptoms and no patient has been diagnosed correctly prior to surgery.

The treatment in general consists of exploration of the common duct and the installation of a T tube for drainage. The surgeon should be aware of the condition and knowing that it exists should explore carefully for the gallbladder but if it is not found a knowledge that the disease may lie within the duct system will prompt exploration of the common duct and T tube drainage. When stones are found they of course will be removed and T tube drainage instituted. —*John H. Davis, M.D.*

Association of Cholelithiasis, Hiatus Hernia, and Diverticulosis Coli. J. J. FOSTER and D. L. KNUTSON. *J. Am. M. Ass.*, 1958, 168: 257.

THE AUTHORS observe that cholelithiasis, hiatus hernia, and diverticulosis coli (Saint's triad) were found in combination in 24 of a group of 713 patients, each of whom had been studied by cholecystogram, a roentgen series of the upper gastrointestinal tract, and barium enema. This represented an incidence of 3.4 per cent. Another group of 58 patients who had undergone cholecystectomy were studied by an upper gastrointestinal series and barium enema, and 11 were found to have both hiatus hernia and diverticulosis coli, an incidence of 19 per cent. The triad occurred with a frequency considerably greater than would be expected from chance alone.

There is indirect evidence to suggest that cholelithiasis is the first condition to appear, followed by diverticulosis coli, and then hiatus hernia. The finding of 75 various combinations in 713 cases that were subjected to a complete study indicates the value of doing all three roentgenographic series in patients who have gastrointestinal complaints.

When a patient who is more than 60 years of age has a history of cholelithiasis or a demonstrable hiatus hernia, the probability of the other elements of the triad being present is greatly increased. Awareness as to the likelihood of the triad, particularly when one of the member conditions is found or known to exist, will aid the clinician in a more accurate appraisal of the patient's complete problem. Awareness as to the existence of the triad has practical clinical value and may explain an apparent failure to effect a cure.

—*Robert Turell, M.D.*

Recurrent Gallstone Ileus. FRANK A. ROGERS and RICHARD CARTER. *Am. J. Surg.*, 1958, 96: 379.

GALLSTONE ILEUS is an unusual type of mechanical bowel obstruction caused by a biliary calculus. The mortality rate is high. Even more rare is the recurrence of the condition due to the entrance of a second stone. Nineteen such cases are reviewed and summarized.

This group of cases is composed of females exclusively, for the most part in the sixth decade. The disposition of the stones was from the pylorus to the rectum, with most of them in the ileum. Recurrences took place at intervals from 18 hours to one year, but approximately one-half of the recurrences were in the 3 week period immediately after discovery of the first stone. The stones are usually large, and generally likened to a golf ball. Faceted stones were noted in a number of cases.

The most common portal of entry of large gallstones is through a cholecystoduodenal fistula. Spontaneous biliary fistulas usually result from acute obstructive cholecystitis in the presence of gallstones. It is not unusual, however, for obstructive symptoms to predominate in gallstone ileus, without a very convincing history of cholecystitis. Once a gallstone has entered the alimentary tract, it may be vomited, pass spontaneously per rectum, or cause intestinal obstruction. It is probable that most stones pass without obstruction.

Clinically a history of gallstones or biliary colic is suggestive. The diagnosis may be suspected in acute cholecystitis when accompanied by excessive nausea and vomiting or refractory ileus. Intermittent severe ileus is characteristic of obturator obstruction, but misleading to the diagnostician. Four roentgen signs pathognomonic of gallstone intestinal obstruction are: (1) air or contrast medium in the biliary tree, (2) direct visualization of the stone, (3) a change in position of a previously noted stone, and (4) evidence of partial or complete intestinal obstruction coupled with air in the biliary tract.

The treatment is surgical. Pressure erosion by the stone at the site of impaction makes the condition potentially strangulating from its onset. Recurrences demonstrate the necessity for exploration of the entire bowel for calculi. The recovery of a faceted stone should also alert the surgeon to the likelihood of other matching stones in the intestine or in the gallbladder. Once it is located an attempt can be made to advance the obstructing stone into the colon and around into the rectum, otherwise the stone should be moved proximally and removed through an enterotomy in healthy bowel. Additional stones in the gallbladder are removed by cholecystostomy. No attempt is made to close the fistula at this time. An interval cholecystectomy may be performed if symptoms persist.

—*Carl Calman, M.D.*

Carcinoma of the Gallbladder: Clinical and Experimental Considerations. J. E. JESSEPH, L. M. NYHUS, T. L. FLETCHER, and H. N. HARKINS. *Bull. Soc. internat. chir.*, 1958, 17: 164.

THE AUTHORS studied 39 patients with carcinoma of the gallbladder who were observed at the King County Hospital, Seattle, Washington from 1948 to 1956. The average age of these patients was 71 years, with a range from 40 to 88. Pain, jaundice, nausea, vomiting, food intolerance, and weight loss were present in 55 per cent of the patients. In contrast to previous reports stating that patients with carcinoma of the gallbladder present a long history of biliary tract symptoms, the authors noted an average duration of symptoms prior to admission of only five and one-half weeks. Only 2 patients had long histories of biliary tract disease in this group. Sixty-one per cent of the patients had the following triad of symptoms: jaundice (56 per cent), mass (61 per cent), and abdominal tenderness (66 per cent).

Twenty-seven patients were treated surgically. In only one patient of this group was the treatment curative. This patient had a small carcinoma that was found microscopically following cholecystectomy for cholecystitis. Exploratory laparotomy and biopsy were done in 15 cases, cholecystectomy in 7, cholecystostomy in 4, and choledochostomy in 3.

The survival period was extremely short. Seventy-seven per cent failed to survive 6 months, while 87 per cent were dead within one year. The authors conclude that the insidious onset, the fulminant course, and the extensive spread of the disease combine to make surgical treatment by the present means almost completely useless.

These authors also studied the effects of certain carcinogenic agents upon the gallbladder and biliary tract in animals. Eight chemical compounds were studied in the gallbladder of cats (20) and in the gallbladder of guinea pigs (90). These compounds were chosen for two reasons: (1) they have been shown experimentally to produce carcinoma at other sites or, (2) they are closely related to substances found in human and animal bile.

In each animal, a pellet was placed in the gallbladder and the cystic duct was ligated to prevent loss of the pellet. Implants have been in place up to 20 months. Some animals were sacrificed at monthly intervals and the gallbladder examined. Uniformly, implantation induced an acute and later a proliferative inflammatory response, with eventual production of a fibrotic, shrunken gallbladder. These changes mimic the gross and microscopic appearance of human gallbladders in long-standing cholelithiasis and cholecysti-

tis. Frank malignancy had not developed in these animals up to the time of publication. However, the study continues and the authors state that if malignancy does develop within a year or two, this will strengthen their conviction that the primary substrate for the genesis of such cancers is chronic and unremitting inflammation, in which a number of physical and chemical agents may be accessory to malignant degeneration. Therefore, they advise cholecystectomy for cholelithiasis in order to reduce the incidence of cancer of the gallbladder.—*John J. Hudock, M.D.*

Primary Adenocarcinoma of the Gallbladder with Metastasis to the Ovaries Already the Site of Primary Papillary Cystadenoma (Adenocarcinoma primitivo della colecisti con metastasi alle ovaie gia sede di altra neoplasia primitiva, cistoadenoma papillifero). CARLO PARENTI. *Arch. ital. pat. clin. Tumori*, 1958, 2: 701.

THE AUTHOR reports the case of a 42 year old woman thought to have a right ovarian tumor. At operation she was found to have bilateral ovarian tumors, the right about the size of an orange, the left the size of a tangerine. Metastatic nodules were found on the uterus. The tumor was considered to be a Krukenberg type and a thorough abdominal exploration was carried out. The stomach was normal. A hydrops of the gallbladder was found which when emptied was found to contain white bile. Palpation at this time revealed a firm circular band at the junction of the superior and middle thirds. Multiple hard lymph nodes were found along the biliary passages but no stones were present. The gallbladder and both ovaries were excised. A small biliary fistula developed which soon healed.

The gallbladder tumor was found to be an adenocarcinoma. The ovaries, however, showed two types of tumor tissue, one a typical papillary cystadenoma and the other a polymorphous glandular neoplasm composed of cubical and polyhedral epithelium with atypical nuclear changes. There was no evidence of mucoid changes in the ovarian tumors.

A review of the literature is presented and after a lengthy discussion on the different possibilities the author favors the idea that this patient presented two different primitive tumors, one in the gallbladder and the other present bilaterally in the ovaries. The metastases in the ovaries were considered to have originated in the gallbladder. Since there was no direct path of continuity present the author believed that the spread occurred through the blood stream.

—*Lucian J. Fronduti, M.D.*

Primary Sclerosing Cholangitis. SEYMOUR I. SCHWARTZ and W. ANDREW DALE. *Arch. Surg.*, 1958, 77: 439.

PRIMARY SCLEROSING CHOLANGITIS is a rare diffuse inflammation of the extrahepatic bile duct which is sufficient to produce jaundice and other symptoms of posthepatic biliary obstruction. It has been referred to by other names, such as obliterative cholangitis and stenosing cholangitis. There are 6 cases included in the report and a review of the literature revealed only 13 additional cases. Any cases which had had previous surgery were ruled out in order to avoid the problem of trauma. The etiology is unknown. Stones were present in only 2 of the 19 cases and no consistent bacteriologic findings have been discovered. There is some suggestion that the inflammation may be due to a virus. Microscopic studies of the area show extreme thickness due to inflammation and fibrosis.

A rational surgical approach based on the degree of involvement of the extrahepatic duct system consists of decompression either through anastomosis or T tube drainage. The authors emphasize the effective results of corticoids in all of their patients, administered in 100 to 300 mgm. doses daily. For long term follow-up meticorten, 40 to 50 mgm. a day, is used. There is a 43 per cent mortality in the 19 cases, however, in the author's series only one of the 6 patients has died. Adjuvant therapy consists of bile salts and broad-spectrum antibiotic therapy.

—*Harold M. Unger, M.D.*

Operations for Restoration of the Bile ducts (Wiederherstellungsoperationen an den Gallengaengen). R. ZENKER and H. HAMELMANN. *Chirurg*, 1958, 29: 385.

OPERATIONS FOR RESTORATION of the extrahepatic bile ducts are indicated in strictures or obliterations following cholecystectomies and occasionally after resection of a deep-seated duodenal ulcer or a gastrectomy. In 2 cases in which the bile ducts were injured during a cholecystectomy the authors were able to make an end-to-end anastomosis of the ductal stumps over a prosthesis. Surgery is also indicated in congenital atresia and in benign and malignant tumors. However, this article deals only with postoperative ductal strictures.

Injuries to the ducts are not always due to technical errors and they occur even with the most experienced surgeon in difficult lesions of the ducts. Injuries to the common or hepatic ducts most often occur during the search for the cystic duct, regardless of whether the gallbladder is dissected from the cystic duct to the fundus or from the fundus to the cystic duct.

Three situations may cause injury to the common duct:

1. If the recess of the gallbladder overlies the cystic duct these structures may be surrounded by a layer of fibrous tissue which causes the common duct during tension to be mistaken for the cystic duct. In such a case incision of the gallbladder, removal of stones, grasping of the gallbladder with forceps, and dissection of the cystic duct out of the connective tissue close to the gallbladder wall is the best treatment.

2. A second danger is present in the case of a shriveled gallbladder. In such a case the cystic duct often seems absent and the common duct may be mistaken for the cystic duct and is easily injured unless the dissection is done close to the gallbladder wall. Injury may be prevented by insertion of a catheter into the common duct or opening of the fundus, removal of any stones, and insertion of the catheter at this point.

3. A third danger of injuring the common duct occurs when the cystic duct runs parallel to the hepatic duct. They are often surrounded by a wall of inflammatory tissue. Ligation or penetration of the hepatic duct is preventable if the cystic duct is dissected from the neck of the bladder, after division of the surrounding tissue, and the dissection continued as far as the entrance of the cystic duct into the common duct.

Another complication is injury of a blood vessel with resultant hemorrhage. A tangential injury of the common duct may occur when the operator is anxious to ligate and divide the cystic duct close to the common duct so as not to leave a stump of the cystic duct behind. In case of hemorrhage from the cystic artery, one should not try blindly to clamp the artery, but rather to control the hepatic artery with fingers and thumb compressing the hepatoduodenal ligament; the bleeding artery may then be visually clamped.

If injury to the ducts is recognized during operation, an immediate repair should be undertaken. This is best done by an end-to-end anastomosis with the finest silk suture and an atraumatic needle over a T-drain. The T-drain should not be led out at the point of anastomosis, but through a longitudinal incision 1 to 2 cm. toward the duodenum. It can then be removed without causing a stricture. The proximal portion of the drain may be split into two halves and each directed into a branch of the hepatic duct. In 2 cases of the authors this was done with resultant smooth healing and the drainage of bile into the intestine.

Compared to primary repair, operations for bridging of defects are most difficult. Because of the jaundice and recurring cholangitis, the liver is damaged. Because of the bleeding tendency and the formation of new vessels in the connective tissue the approach to the liver hilus becomes most difficult.

The abdomen is best opened through the old scar. The adhesions of the colon and mesocolon to the lower surface of the right lobe of the liver are freed, the scar of the former bed of the gallbladder is located, the adherent duodenum is separated, and the hepatoduodenal ligament and the foramen of Winslow are exposed. The proximal stump of the duct is sought by longitudinal incision of the hepatoduodenal ligament. After the duct is located, it is not opened at once but is punctured for verification. After it has been dissected as far proximalward as possible, the stump is opened.

Now a decision must be made as to the manner of restoring the flow of bile into the intestine. Until recently, anastomosis of the stump to the duodenum or jejunum was preferred. However, spurred by the reports of Cattell and Lahey, direct end-to-end anastomosis of the stumps has been attempted. The authors have done this 4 times with good results.

The distal stump, after freeing of the lateral border of the duodenum, can usually be found without difficulty. To overcome the tension between the two stumps, the duodenum and head of the pancreas must be mobilized and the retroperitoneal duct dissected from the pancreas. The duct can be stretched 1 to 2 cm. at this point. Bleeding makes this dissection tedious. The anastomosis is made end-to-end over a T-drain. To prevent tension, the pancreas and duodenum are united to the connective tissue in the liver hilus and to the hepatoduodenal ligament. According to Cattell and Lahey, an end-to-end anastomosis is possible in 80 per cent of the cases. A detailed description of the authors' 4 cases follows.

When an end-to-end anastomosis is impossible, anastomosis with the duodenum or jejunum is indicated. It seems to make little difference whether the duodenum or jejunum is chosen. In order to insure lasting drainage, it is necessary to have a wide lumen of ductal stump and exact approximation with the mucous membrane; tension must be overcome by fixation of the intestine to the liver hilus. A typical case of successful anastomosis, following a previous attempt with failure, is described.

A short description of the Longmire technique follows, but it is too early to determine its success.

Direct anastomosis or anastomosis of the hepatic stump to the duodenum or jejunum without tension are the operations of choice to-day.

—*Alfred H. Noehren, M.D.*

Isolated Traumatic Lesions of the Pancreas and Posttraumatic Pancreatosis (Lesioni traumatiche isolate chiuse del pancreas e pancreatosi postraumatiche). M. MARSIGLIA. *Chirurgia*, 1958, 13: 213.

THE AUTHOR reports on 4 patients who were treated for traumatic lesions of the pancreas at the University of Milan Surgical Clinics.

The first patient had a complete transection of the tail of the pancreas which was necrotic and was excised. The next 2 patients had extensive contusion with hemoperitoneum and were treated by draining the retroperitoneal space. The fourth patient was found to have a pancreatic pseudocyst which was drained internally through an ileal loop. This patient had been kicked in the epigastric region 5 years before and was treated symptomatically with gradual relief of pain in 2 days.

After a discussion of the subject the author concludes that the treatment varies according to the findings. Medical management is advised for simple contusions. When the trauma is severe enough to cause a rupture of the capsule producing a hemoperitoneum, surgical intervention is usually indicated because of the persisting severe symptoms. If there is no devitalization of the gland, hemostasis and drainage is the treatment of choice. If part of the gland is devitalized, it should be excised and the remaining stump sutured with interrupted sutures and covered with omental tissue. Drainage is considered indispensable.

Postoperative care is very important and antivagal drugs are used to reduce pancreatic secretions. The blood sugar and blood calcium levels should be carefully followed and treatment instituted when necessary. Large quantities of calcium may be deposited in the contused pancreatic gland.

—*Lucian J. Fronduti, M.D.*

A Survey of Acute Hemorrhagic Pancreatitis. ELMER W. HEFFERNON and ALFREDO C. CASSIET. *Gastroenterology*, 1958, 35: 251.

THE AUTHORS studied 100 patients with acute hemorrhagic pancreatitis who were treated at the Lahey Clinic between 1923 and 1955. The diagnosis was proved by surgery or autopsy in all but 3 cases. In these 3 cases, the diagnosis was made by clinical and laboratory means.

In the analysis of these cases it was significant that 30 of the patients had known disease of the gallbladder; 28 patients admitted to a moderate alcohol intake and 6 to heavy alcohol intake. Eleven patients had duodenal ulcers and 14 had had previous gastric

surgery. Of the latter, acute pancreatitis occurred following gastric surgery in 10 cases. Six patients had gallbladder surgery followed by acute pancreatitis. Two patients were known drug addicts.

The most common symptom was abdominal pain which was present in 75 patients. In 41 patients the pain was epigastric, in the remainder pain was located in all four quadrants, the periumbilical region, and generalized throughout the abdomen. Abdominal tenderness was found in 54 cases of this group, tenderness in the right upper quadrant in 32 cases, in the epigastrium in 13, in the left upper abdominal quadrant in 3, the left lower quadrant in 2, and the tenderness was generalized in 5. Surgical shock was present in 22 cases. Obstructive jaundice was present in 19 cases.

The serum amylase was determined in 48 patients. During the first 72 hours it was elevated in 15 patients and normal in 10; at the end of the first week it was elevated in 13 patients and normal in 10. The most common roentgenologic finding was cholelithiasis which was present in 22 cases.

Eighty patients were subjected to abdominal surgery. Thirty-six were seen and operated upon during the first week of illness; of this group 11 died. The remaining 44 were operated on a week or more after the illness had been in progress; of this group 5 died. The most common pathologic finding was an enlarged, indurated pancreas in 54 cases. Fat necrosis was present in 43 cases, hemorrhage in 36, pancreatic cysts in 8, and abscess in 6 cases.

Surgical treatment varied, the most common procedure being choledochostomy in 38 cases, followed by incision and drainage of the pancreas in 32 cases. Twenty-four cholecystectomies and 2 cholecystostomies were performed.

Twenty patients were treated by a medical regimen alone and 19 of these died. Sixteen patients were treated medically during the first week of their illness and all of these died. All the medically treated patients were gravely ill and poor surgical risks.

Follow-up was possible for periods from 1 month to 26 years. Of the patients traced, 16 had an excellent result, 34 a good result, and 15 a fair result. Thirty-five died of pancreatic disease later.

In this study, in contrast to other studies, 19 of 20 patients who were treated medically died. However, the authors advise careful medical care once the diagnosis of acute hemorrhagic pancreatitis has been established. Careful follow-up is advocated in order to detect latent diabetes mellitus, chronic relapsing pancreatitis, pancreatic fistula, and other late sequelae. —*John J. Hudock, M.D.*

Pathogenesis of Acute Pancreatitis. ARCHIE H. BAGGENSTOSS. *Minnesota Med.*, 1958, 41: 599.

IT IS THE OPINION of the author that his review by no means exhausts the clinical and surgical conditions associated with acute pancreatitis and pancreatic necrosis, but that enough has been said to emphasize the complexity of the pathogenesis of this disease of the pancreas. Although the experimental methods used to produce pancreatitis have done much to elucidate the pathogenetic mechanisms involved, most clinical, surgical, and pathologic observations support the view that this disease is not the result of any one factor nor any one combination of factors, but that there are a great many factors and that they are often present in different combinations. In other words, the tissues and secretions of this organ have been found to respond in a similar fashion to a wide variety of injuries.

Pancreatitis is a broad term and embraces a great variety of lesions. Under this heading may be found acute interstitial pancreatitis, acute pancreatic necrosis, acute hemorrhagic pancreatitis, and acute suppurative pancreatitis. Disease of the biliary tract seems to be a common accompaniment. Occlusion of the pancreatic duct alone does not produce pancreatitis but requires the additional factor of secretory stimulation. Clinically, the first symptoms of acute pancreatitis often appear after a big meal. It should be noted that for many years the factor of obstruction has been overemphasized and the factor of infection, underestimated. A vascular factor also is frequently mentioned, and although arterial occlusion or vascular erosion may not be important in the initiation of the disease, it may be very important in the progression of the lesion. Another condition that is commonly emphasized as being of pathogenetic significance in most large series of clinical cases of acute pancreatitis is alcoholism. Recent reports offer still another possible role for alcohol in the etiology of pancreatitis, namely, the protein and vitamin deficiencies that occur in chronic alcoholic patients. In most cases of postoperative pancreatitis the disease occurs after operations on the stomach and biliary tract. Of particular interest are the cases in which pancreatitis occurred after operations far removed from the pancreas, such as transurethral prostatic resection. Pancreatitis that occurs during and shortly after pregnancy also is poorly understood and warrants further investigation.

Every case should be studied carefully from the clinical, chemical, surgical, and pathologic aspects, in order to learn more about the pathogenesis of this disease. Each case presents its own problems, and factors that may be of pathogenetic significance in one instance may not hold at all for the next one. For this reason the practicing physician and surgeon, by careful observation, can contribute greatly to our knowledge of this condition and can often indicate new methods for the experimentalist to use in approaching the problem.

Retrograde Surgical Drainage of Pancreas for Chronic Relapsing Pancreatitis. CHARLES B. PUESTOW and WILLIAM J. GILLESBY. *Arch. Surg.*, 1958, 76: 898.

THE AUTHORS, from the Veterans Administration Hospital at Hines, Illinois, state that primary chronic relapsing pancreatitis extends throughout the pancreatic tissue and that adequate drainage of the pancreas is a necessity. They suggest that caudal pancreaticojejunostomy is an inadequate procedure and present their modification.

As a background for this new operative procedure the authors note certain principles relevant to this disease. The pain of chronic relapsing pancreatitis is due to increased intraductal pressure resultant from partial duct obstruction and if the ductal system is

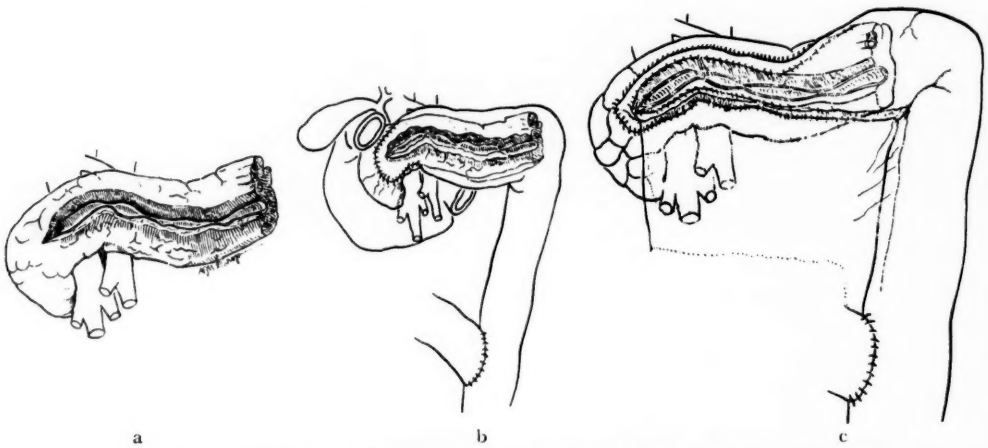


FIG. 1 (Puestow, Gillesby). a, Pancreatic duct split open, showing alternate stenotic and dilated areas. b, Anterior view of pancreaticojejunostomy with jejunum sutured to the right of the opened pancreas. Roux-Y enteroanastomosis has been done below the mesocolon. c, Pancreaticojejunostomy with opened pancreas and opened jejunum, so that the pancreaticojejunostomy is a side-to-side anastomosis.

adequately decompressed, pain will be relieved. Calcification occurs in the substance of the pancreas and is not limited to the pancreatic ducts. Alternate dilatations and stenoses of the pancreatic ducts are readily demonstrated on pancreatograms which reveal a "chain of lakes" effect (Warren). Mucoid material of a stringy consistency is present within the pancreatic ducts.

Their operative procedure is as follows: At laparotomy the gastrocolic omentum is divided and the body and tail of the pancreas exposed. After a splenectomy the tail of the pancreas is mobilized as far to the midline as the superior mesenteric vessels. The tail of the pancreas is incised transversely until the duct is found, the distal pancreatic tissue is amputated and sent for biopsy. A probe is then passed into the pancreatic duct and the pancreatic duct split open as far to the right as possible and if the duct of Wirsung or the duct of Santorini is dilated, it is also split open. After securing hemostasis one can visualize alternating dilated and stenotic areas of the pancreatic duct as well as pancreatic juice exuding from small openings throughout the length of the duct. The tail of the pancreas is slipped into the opened divided jejunum and the jejunum is used as a sheath over the opened pancreas. The jejunum will come over as far as the superior mesenteric vessels posteriorly and as far as the opened duct anteriorly, if the diagonal severing of the jejunum is correctly done. The edge of the pancreas is then sutured to the edge of the severed jejunum on the anterior surface both superiorly and inferiorly and is sutured to the posterior pancreas to the left of the superior mesenteric vessels. After checking this anastomosis a Roux-Y re-establishment of continuity below the mesocolon is then done. The area is drained with a Penrose drain brought out through a stab wound on the left side and slight pancreatic juice drainage may be found to persist for 2 weeks.

An alternate method for performing this procedure is to split the pancreas open as far to the right as possible and then split open the distal portion of the jejunum 4 to 6 inches. The raw edge of the pancreas is then sutured to the raw edge of the jejunum.

In the last 4 cases in which this procedure has been performed either by the sheath method or by the side-to-side method, the results have been excellent. Relief of pain is almost immediate and there has been clinical evidence for regeneration of residual pancreatic tissue. —*Gilbert S. Campbell, M.D.*

Acute Postoperative Pancreatitis After Resection of Gastroduodenal Ulcers (Die akute postoperative Pankreatitis nach Resektion von Magen-Zwölffingerdarmgeschwüren). TON THAT TUNG, A. K. SCHMAUSS, and NGUYEN DUONG QUANG. *Chirurg*, 1958, 29: 413.

ULCER DISEASES are quite common in the country of North Vietnam. There were about one thousand resections for ulcers at the University Clinic in Hanoi within a single year. Ten of these patients had an acute pancreatitis as a postoperative complication. In 7 patients the diagnosis was established within the first few hours after the onset of symptoms. Only 3 of those patients could be saved. In 2 patients the correct diagnosis of an acute postoperative pancreatitis could not be established in time; in one case the correct diagnosis was changed later because of the lack of symptoms.

The patients who had acute postoperative pancreatitis following gastric resection were divided into four groups:

1. Patients who had trauma to the pancreas during surgery. This usually occurred in cases in which the ulcer penetrated into the pancreas. Of the thousand

gastric resections performed, 7 patients had pancreatitis due to trauma.

2. Patients who had injury to the pancreatic duct; one case.

3. Patients in whom there was stagnation of the duodenal contents; one case.

4. Patients without any evidence of damage; one case.

If the diagnosis was established in time, exploration of the pancreas was performed and Penrose drains were inserted. This procedure was carried out in 8 cases and 3 of the patients lived. Of the 7 patients who did not survive 2 died within the first week, 2 between the second and third week, and 3 of them later. In the author's opinion the treatment of acute pancreatitis after gastric resection is transfusion of whole blood and plasma and surgical drainage of the affected part of the pancreas.

—*Frank Lichtenheld, M.D.*

Disturbance of Electrolyte Exchange in Fibrosis of the Pancreas (Die Stoffwechselstoerungen bei der Pankreasfibrose). K. KLINKE, H. D. GAIGALAT, and H. BRÜSTER. *Deut. med. Wschr.*, 1958, 83: 1604.

CYSTIC FIBROSIS of the pancreas appears (1) as meconium ileus, (2) as steatorrhea with decreasing digestion, and (3) as constantly increasing bronchiectasis. To these conditions may be added a fourth, which until now has been of only diagnostic importance, it is the anomaly of the electrolyte content of the perspiration.

1. In the newborn immediately after birth, signs of intestinal obstruction or of breaking through of meconium into the peritoneal cavity appear. The only possibility of preventing this is by surgery, an enterostomy plus washing out of the exposed intestine with a solution of pancreas ferment. Usually the diagnosis is made at autopsy.

2. If pathologicoanatomical changes in the pancreas are less pronounced, the poor digestion with steatorrhea may mark the disease. By supplying pancreas ferments, disturbances of digestion and steatorrhea may be prevented.

3. In later years, bronchiectasis develops which eventually overshadows the other symptoms. Infection then causes pneumonia, suppurative pleurisy, atelectasis, and emphysema. Secondary disturbances are hypoproteinemia and hypovitaminosis. Later circulatory disturbances cause a cor pulmonale with club fingers and cyanosis.

4. Marked changes in the electrolyte concentration in the perspiration were accidentally discovered. Sodium and chlorine are increased up to five times normal, while the potassium concentration shows no change. This same condition of the perspiration is found in otherwise normal members of the family of these patients. The causes of these perspiration anomalies are still not clear. Mucus producing glands have been implicated. According to Bodian, there may be an enzymatic escape of mucus producing cells. The disease is not rare, 0.7 to 1.0 per cent of all births. This figure varies in different sections of the country and cannot be accurate since many members of the patient's family are considered healthy, unless their perspiration is examined.

Changes in the pancreas and other glands may be present for a while without any symptoms. In 80 per cent of such cases, the pancreas may be found to be diseased at autopsy without any change in the production of its ferment during life. But in 99 per cent of the cases of fibrosis of the pancreas, there is no increase in the electrolytes of the perspiration, and this is true in a percentage of family members who show no other signs of the disease.

The formation of perspiration is not well understood. Formerly only that produced by heat or exercise could be examined, thus leaving out of consideration the invisible perspiration. Under these conditions the circulation is increased, the amount of perspiration is increased and even more the loss of salt, and there are changes in the cell formation, all of which do not tell anything about normal perspiration. Only by means of flame photometry has it been possible to determine the small amounts of salt and therefore to examine the natural perspiration accurately. A detailed description of the method is given.

The discovery of the electrolyte changes in fibrosis of the pancreas has caused general interest in the examination of the perspiration. In an examination of 500 cases, the sodium content was 6.6 to 37.6 in normal cases and 36.4 to 189.4 in fibrosis, chlorine 6.0 to 38.4 in normal cases and 49.6 to 196.1 in fibrosis. These figures show that the sodium and chlorine concentration in children with fibrosis of the pancreas was increased five times. This increase begins even in resting perspiration, while potassium remains unchanged, but in heat perspiration potassium is increased up to six times.

Another finding is that the intracellular spaces are greatly increased, while the plasma space is diminished.

In all these examinations, the electrolyte content of the urine was not changed and no signs of kidney damage could be demonstrated in this disease.

The authors ask for confirmation of these findings, as in their experience a fully developed fibrosis of the pancreas is a rare disease.—*Alfred H. Noehren, M.D.*

Splenectomy in Hemolytic Anemia; Results Predicted by Body Scanning After Injection of Cr^{51}-Tagged Red Cells. PAUL R. MCCURDY and CHARLES E. RATH. *N. England J. M.*, 1958, 259: 459.

THE AUTHORS studied 50 patients with various hematologic disorders, including 10 in whom splenectomy was done, utilizing the technique of body surface scanning after the injection of red cells tagged with radioactive chromate, using a modification of Jandl's method.

The method consisted of injecting tagged red cells, followed immediately by monitoring the spleen in anterolateral projection, with a unidirectional scintillation counter, until equilibrium was reached. Blood volume studies were done on venous blood drawn at 15 and 30 minutes. After equilibrium over the spleen, the anterior projections of the liver, heart, and spleen were counted. From these counts ratios were constructed between the spleen and precordium (S/P) and liver and precordium (L/P). This procedure was repeated daily to twice weekly until a definite trend in ratios occurred.

The Splenic Localization Index (SPI) was derived from the following formula:

$$\frac{\frac{\triangle S/P}{S/P_o} \times 10}{^{d}max} = \text{Splenic Localization Index (SLI)}$$

in which $\triangle S/P$ denotes the maximum change in ratio, S/P_o, the initial ratio, and ^{d}max, the day on which the maximum ratio occurred.

Nine of the 10 patients who had a splenectomy were benefited. All 9 patients had a maximum S/P ratio of 1.5 or over and 8 had an SLI of 1.0 or over. The one patient who was not benefited by splenectomy had a maximum S/P ratio of 0.7 and an SLI of 0.0. On the basis of these results, the authors conclude that the test is considered to provide a positive indication for splenectomy if the maximum S/P ratio is over 1.5 and the SLI is 1.0 or over. A false positive was obtained in a patient having polycythemia vera plus metastatic carcinoma of the prostate, therefore correlation of the clinical data with the test is advised before doing a splenectomy.

Splenic equilibration tissue studies were also performed on these patients but it was concluded that the data were not reliable in the decision for or against splenectomy.

The selection of patients with acquired hemolysis, autoimmune or otherwise, is often difficult. There has been no method of selecting for splenectomy only the patients who will respond. Since 50 per cent or less go into complete remission after operation, a number of patients will be subjected to needless surgery.

This test based on the maximum S/P ratio, the spleen localization index (SLI), and the clinical picture appears to be a reliable method for selecting patients with hemolytic anemia for splenectomy.

—John J. Hudock, M.D.

MISCELLANEOUS

Idiopathic Retroperitoneal Fibrosis. EARLE HACKETT. *Brit. J. Surg.*, 1958, 46: 3.

IDIOPATHIC RETROPERITONEAL FIBROSIS is the name which has been given to a recently recognized disease characterized by the presence of an abnormal, dense, flattened plaque of fibrous tissue in the retroperitoneal space. The fibrous tissue lies anterior to the fascia of the iliopsoas muscles and bodies of the lumbar vertebrae but does not extend into the mesenteries. The boundaries of the lesion in reported cases are the level of the diaphragm superiorly, the pelvic brim inferiorly, and laterally, a line one centimeter lateral to the uterus. This area corresponds to the renal fascial compartments. The fibrosis does not necessarily involve the total area and may be unilateral or bilateral. The fibrous tissue may be up to 2 centimeters in thickness and microscopically presents the appearance of a scar.

The etiology of the disease is unknown. The author suggests that retroperitoneal hemorrhage with organization of the hematoma may be the cause.

The symptoms of the retroperitoneal fibrosis are varied and are caused by constriction of the structures of the retroperitoneal space. Compression of the ureters produces oliguria, anuria, and hydronephrosis. Constriction of the aorta causes claudication and signs of distal arterial insufficiency. Vena caval obstruction produces venous distention and swelling of the legs. Low back pain is explained by stiffening of the lumbar spine. The various symptoms occur separately or in combination depending upon the structures impinged upon. Apparently the fibrous tissue does not invade the structures. Part of the ureteral obstruction is thought to be due to the loss of peristalsis.

Two cases are reported. A 40 year old man was found to have slight dilatation of the pelvis of the left kidney in 1953. He died with uremia in 1956. Autopsy revealed bilateral hydronephrosis. There was a plaque of yellowish white fibrous tissue constricting the right ureter, constricting the aorta, and occluding the vena cava. Microscopic examination of the tissue showed it to be fibrous and collagenous. Para-aortic lymph nodes contained hemosiderin.

A 54 year old man who had low back pain was subjected to an exploratory operation because of an abnormal shadow observed by barium enema. There was no lesion of the colon but there was a woody swelling in the retroperitoneal area, a biopsy of which revealed fibrous and fatty tissue. An aortogram revealed narrowing of the distal aorta and iliac arteries. Subsequently an intravenous pyelogram revealed localized pressure on the right ureter. Relief of symptoms followed roentgen therapy.

The treatment is not standardized. It is suggested that release of constriction of the vascular and urinary structures could be accomplished surgically.

—Lockert B. Mason, M.D.

GYNECOLOGY

UTERUS

Optimum Spacing of Repeat Follow-Up Papanicolaou Smears. BEVERLY SCHULZ, D. J. CARLSON, and E. A. BIRGE. *J. Am. M. Ass.*, 1958, 168: 248.

THE RESULTS of 15,389 cytologic examinations for carcinoma of the cervix uteri have been analyzed for the purpose of deciding how frequently such tests should be repeated. Approximately 65 per cent of the examinations were repetitions on the same women, since the group represented a small, relatively constant segment of the population closely watched over a period of years. In 4 cases there was a conflict of findings, but with that exception the authors found only a single patient who, having had initially normal smears, exhibited cytologic abnormalities at subsequent examinations. The data showed that periodic cytologic examination yields diminishing returns and that new cases generally represent the introduction of new members into the group. The evidence led to the conclusion that lengthening the interval between cytologic examinations to 2 years will not appreciably increase the risk to the patient if pelvic examinations are done at the same time.

—John R. Wolff, M.D.

A New and Rapid Method for Diagnosis of Vaginal and Cervical Cancer by Fluorescence Microscopy. LUDWIG BERTALANFFY and FRANCIS MASIN. *Cancer*, 1958, 11: 873.

A NEW TECHNIQUE for the detection of gynecologic cancer in exfoliative cytology, using fluorescence microscopy with acridine orange NO (AO) as fluorochrome, is described.

The method was tested in a total of 650 cases: 58 gynecologic cancers, 390 cervical lesions, 150 normal vaginas and cervices, and 52 preparations of various organs, including 25 cancers.

The fluorescence picture of the normal vaginal cervical epithelium, atypical epithelium, and squamous cell carcinomas is described.

The main advantages of the AO technique are: (1) the simplicity of the method and the need of only inexpensive and commercially available auxiliary equipment; (2) the rapidity of the staining procedure; and (3) the brilliance of the fluorescence picture, which allows for rapid scanning and easy recognition of suspicious cells under low magnification as well as detailed evaluation of the morphologic pattern under higher power.

The AO method is essentially based upon differentiation of the two nucleic acids by acridine orange NO, desoxyribonucleic acid (DNA) giving green fluorescence and ribonucleic acid (RNA), red or orange fluorescence. Hence the method reveals the cytophotochemical changes connected with malignant growth.

The AO method is, with suitable adaptations, applicable with essentially similar results to living, supravital, and fixed tissues, smears, and frozen sections.

—John R. Wolff, M.D.

The Urinary Complications of the Radio-Surgical Treatment of Uterine Cervical Cancer and Their Pathogenesis (Les complications urinaires du traitement radio-chirurgical du cancer du col et leur pathogénie). J. MAGENDIE, R. BALLANGER, D. BOURSIER, M. RÉGNIER, and Others. *Bordeaux chir.*, 1958, p. 69.

FORTY PATIENTS with cancer of the uterine cervix were operated upon following irradiation therapy. Eight of the earlier patients underwent the Wertheim operation as modified by Brenier; 32 were treated by the method of Meigs, but no attempt was made to preserve the arterial supply to the ureter from the hypogastric artery.

There were no deaths, but the morbidity was 23 per cent. This does not equal the excellent results reported by Meigs (morbidity 10.9 per cent) but compares favorably with the results reported by other workers (Popovici, 29 per cent; Martin *et al.*, 30 per cent).

In addition to three early complications, which were controlled by medical measures, and two fistulas resulting from accidental injury of the ureter during operation, there were 3 instances of delayed irradiation necrosis of the bladder or ureter which could not be ascribed to the operative method employed.

There were also 4 instances of serious urinary complication which require a more detailed discussion of their pathogenesis and of the possibility of preventing them.

The first of these patients developed a huge hematoma in the left pelvis as the result of anticoagulative therapy. Two weeks after operation an obstruction of the left ureter developed. Medical measures (cortisone, typhomycine) corrected the trouble to a great extent within a few days.

The second patient also developed ureteral obstruction. The condition was diagnosed promptly, but lack of co-operation on the part of the patient resulted in loss of the kidney.

The third patient presented an obstruction and fistula. She bled profusely during operation and there was probably bleeding into the operative field after the operation with the development of an infected hematoma. The result was septic necrosis of the ureter and a fistula. Signs of renal distention appeared later and were thought to result from secondary contraction of inflammatory tissue and the sclerosing effect of irradiation therapy. Transplantation of the ureter (Boari method) resulted in saving the kidney.

The fourth patient developed a fistula involving the right ureter and later signs of obstruction. At reoperation the juxtavesical portion of the ureter was found involved in an extremely dense, sclerotic mass which evidently resulted from the previous irradiation therapy. There was no evidence of a previous hematoma formation. The authors conclude that the fistula resulted from an ischemic necrosis, and that removal of the peri-ureteral tissue jeopardized the blood supply of the ureter which was already diminished as the result of preoperative irradiation therapy. Transplantation of the ureter (method of Boari) resulted in saving the kidney.

—John W. Brennan, M.D.

The Argument Against Preoperative Radium for Endometrial Cancer. CHAS. E. MCLENNAN. *West. J. Surg.*, 1958, 66: 193.

THE AUTHOR speaks out against the so-called procedure of choice or generally accepted theory of the use of intracavitary radium as a preliminary procedure to hysterectomy in the treatment of carcinoma of the endometrium.

In an extensive review of the literature he states he found no good reason given to delay the definitive surgical treatment of endometrial carcinoma by the introduction of radium. In the early days little distinction was made between cervical and endometrial cancer and the surgeons were not unhappy to get rid of the depressing mortality and morbidity associated with cancer surgery by letting the radiotherapists treat these patients. He quotes the statement of W. S. Stone (1917), the assistant director of cancer research at Memorial Hospital, "There is no experimental or clinical evidence that the application of radium to an early lesion of the uterine body prior to the performance of a hysterectomy will in the least jeopardize the result of the operation. It would appear to be a perfectly legitimate field for experiment." Howard Kelly, at about the same time, was advocating radium for cervical cancer but was opposed to it for cancer of the uterine corpus. William P. Healy, supported by Heyman of Stockholm, was one of the men who was enthusiastic about the use of radium before surgery.

The author noted that Sampson issued a subdued warning about the dangers of intrauterine radium in 1934, but by then the practice was widely accepted. According to the author the statistics did not prove the point because of methods of selection. Javert at the New York Hospital has been one of the more recent dissenters and the author states that Graham's report from the Boston area offers the clinching argument against the alleged virtues of preoperative radium. Finally, J. Chandler Smith, a pathologist from Saginaw, Michigan, has said: "Combined therapy is based on the premise that radium within the uterus before operation provides an advantage over hysterectomy alone in the eradication of tumor cells . . . When the carcinoma is superficial, radium may be curative. In this event, the subsequent hysterectomy provides no contribution to the result and needlessly exposes the patient to the risk of a major operation. When the cancer is deep, the preoperative application of radium is redundant, because cure cannot be achieved without hysterectomy. In this event, delay in the removal of cancer is countenanced and the patient is needlessly exposed to the possibility of radium-induced complications . . . Since depth of tumor-cell penetration may render the effect of intrauterine radium inferior to that of hysterectomy, and as the depth cannot be defined at the onset of treatment, and as hysterectomy is obligatory regardless of that penetration, the reason for inserting radium into the uterus before operation is obscure."

The author then quotes his figures from the Stanford University Hospital which seem to bear out his argument. The figures from the Massachusetts General Hospital also confirm the impression but to a lesser extent. He thinks that they have been fortunate in attracting a higher per cent of early cancers.

In summarizing, the author states that the best argument against the use of preoperative radium is that no convincing argument has ever been given for it. He believes the practice should be abandoned.

—Byford Heskett, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Polycystic Ovarian Disease (Stein-Leventhal Syndrome): Etiology and Rationale for Surgical Treatment. TOMMY N. EVANS and GARDNER M. RILEY. *Obst. Gyn.*, 1958, 12: 168.

SINCE Stein and Leventhal called attention some 35 years ago to a group of young females with amenorrhea, sterility, and hirsutism, much effort has been directed toward establishing a more precise definition of this syndrome. A purpose of this article is to identify more accurately the patients with this complaint and to add to the criteria that should be met before these patients are subjected to surgery.

Twenty-five patients with the diagnosis of Stein-Leventhal syndrome have been subjected to bilateral ovarian wedge resections at the University of Michigan in the 6 year period 1951–1957. Good results (for example, resumption of ovulatory menstrual cycle) were achieved in those 19 patients who preoperatively had both follicle-stimulating hormone (6 to 53 mouse units) and estrogen (5 to 3 rat units) levels in the normal range. Of this group 16 have become pregnant.

All of the 19 had been amenorrheic for at least 1 year. Twelve were neither obese nor hirsute. Ovarian enlargement was detected in 16. In none of the 19 could ovulation be demonstrated by basal body temperature charts or daily serial vaginal smears.

Ovarian tissue removed from these patients revealed numerous follicular cysts, closely packed beneath a thickened capsule (tunica albuginea). None of the cysts exceeded 1.5 cm. in diameter, and most did not extend beyond the surface. Within some of these follicles the theca interna was composed of thin spindle cells showing little mitotic activity; however, within most of the follicles the theca interna was found to be hyperplastic.

In all 6 patients not obtaining a favorable result from operation, levels of follicle-stimulating hormone or estrogen or both were abnormal. One of the 6 demonstrated marked masculinization and had an elevated 17-ketosteroid excretion rate. Four of the 6 had endocrine determinations below normal. The last patient in this group of 6 had subnormal estrogen levels and elevated follicle-stimulating hormone levels, reflecting probable primary ovarian failure. From the results obtained in this group, the authors judged that patients whose levels of estrogen or follicle-stimulating hormone or both are below normal will receive little benefit from bilateral ovarian wedge resection.

Experimentally it has been shown that ovarian cysts result when continued production of follicle-stimulating hormone persists in spite of decreased amounts of luteinizing hormone. The authors believe this is the most likely etiologic factor. The operation removes many of the atretic follicles. Production of estrogen consequently is decreased, and production of gonadotropins concomitantly is increased. This stimulates a

new crop of follicles. The pituitary then responds to the increasing estrogen level by the secretion of adequate amounts of luteinizing hormone.

If the above reasoning is correct, a successful form of endocrine therapy should eventually supplant surgical methods. Until such therapy is recognized, however, the authors believe ovarian wedge resection is desirable because of its proved effectiveness.

—*Stephen W. Carveth, M.D.*

EXTERNAL GENITALIA

Remarks on the Value of Vaginal Smears and Their Changes in Patients with Neoplasm of the Uterine Cervix During and After Radiotherapy (Considerazioni sul valore del striscio vaginale e delle sue modificazioni in pazienti affette da neoplasia della portio uterina durante e dopo trattamento radiante). Franco Mainoldi and Francesco Raiti. *Riv. ital. gin.*, 1958, 41: 361.

Biopsy, although the best method for ascertaining the type of tumor and its response to radiotherapy, is painful to the patient and cannot be repeated too many times during treatment. The vaginal smear may be checked daily for observation of the effect of radiotherapy on the tumor. Following instructions concerning the technique of procuring vaginal smears and staining and a discussion of normal and neoplastic vaginal cytology, the authors describe their findings in 47 patients suffering from tumors of the uterine portio at the time of admission and 3 years after radiotherapy.

Of these patients, 26 were in good condition at the time of follow-up and showed no signs of recurrence. Two patients were lost to follow-up, and 19 patients had died from recurrence or extension of the neoplastic process. A good prognosis appeared justified if no neoplastic cells could be demonstrated in the vaginal smear 20 days after beginning radiotherapy. Otherwise the prognosis was grave. Of 31 patients who had exhibited no neoplastic cells, 24 were in good health at the time of the last examination, one had disappeared, and only 6 were dead, thus proving the diagnosis correct in 77 per cent. Of the 16 patients in whom neoplastic cells persisted, 2 patients were alive, one had disappeared, and 13 were dead, thus proving the diagnosis correct in 81 per cent. Of 6 patients with negative cytologic reports who died, 3 died after 2 years, 2 of them having had complete remissions for 2 years. These results would seem to confirm the usefulness of control by vaginal smears during radiotherapy for tumors of the uterine portio and as an aid in establishing the prognosis.

—*Edith Schanche Moore*

MISCELLANEOUS

Genital Trichomoniasis, a Venereal Disease; Examination of Husbands of Women with Trichomonas Vaginalis Infection (Trichomonadenbefall der Genitalien; venerische Erkrankung; Ergebnisse von Untersuchungen an Trichomonas vaginalis leiden). J. M. Bedoya, G. Rios, and L. R. Rico. *Geburtsh. & Frauenh.*, 1958, 18: 989.

The source of Trichomonas vaginalis infection in women has been controversial. Bath water, swimming pools, and mechanical transmission have been considered, but without conviction. Published reports have indicated that from 8 per cent to 80 per cent (25 to 55 per cent in most reports) of the husbands of women with trichomoniasis harbor the organisms. It has been assumed that the husband contracts the parasite from his wife, and that he remains without symptoms while carrying the organism.

The husbands of 62 women who had vaginal trichomoniasis were repeatedly examined. The organisms were found in the urethra or in the seminal or prostatic fluid in 47 (76 per cent) of these males. The interval since the last intercourse varied from one day to 5 months, according to the history from the infected males.

Forty-six of the 47 males in whom trichomonads were found admitted extramarital relationships, usually with prostitutes. The interval between such relationships and the examination varied from a few days to 10 years. Nineteen of the 47 males had no symptoms. In 28, symptoms included itching of the anterior urethra, morning discharge, and urinary urgency. In 25 of the males small amounts of slimy or purulent discharge could be stripped from the urethra. Twenty-four of the 47 men had a history of gonorrhea, syphilis, or chancroid. This report is written from Granada, Spain, where, according to the authors, it is customary for girls to be married in the virginal state, and where the males exercise considerable sexual freedom both before and after marriage.

Only one of the 15 husbands in whom no Trichomonas organisms were found denied extramarital intercourse. Many of the 15 men without demonstrated infection had symptoms referable to the anterior urethra, and the authors believe that their failure to find parasites in the genital tract does not preclude their presence. The parasites, even when demonstrably present in the male, are fewer in number and much less readily found than in the female. The organisms in the male tend to be smaller and less active than in the female.

Genital trichomoniasis seems to be a typical venereal disease affecting both males and females. Permanent cure can be accomplished only by treating both husband and wife. —*Elmer V. Dahl, M.D.*

Genital Trichomoniasis, a Venereal Disease; Incidence in Prostitutes and in Virgins (Trichomoniasis der menschlichen Genitalien, venerische Erkrankung; Trichomonadenbefall bei Dirnen und Jungfrauen). J. M. Bedoya, L. R. Rico, and G. Rios. *Geburtsh. & Frauenh.*, 1958, 18: 994.

If the concept of venereal dissemination of Trichomonas vaginalis is correct, one would expect to find this flagellate in a high percentage of prostitutes. In an early study, the authors demonstrated T. vaginalis in only 25 per cent of 228 prostitutes. Because these women habitually douche and evacuate the bladder prior to compulsory periodic medical examination, the figure 25 per cent was considered much too low, and further investigations were begun. Material from the urethra was repeatedly obtained and examined from those females whose vaginal secretions did not reveal the parasite.

Unfortunately, compulsory periodic examination

of prostitutes was discontinued in Spain at the time this study was begun, and only 30 such females were examined. Trichomonas vaginalis was found in 22 of these 30 (73.3 per cent). In 9 prostitutes, the organisms were found in the vaginal secretions and in 13, in material from the urethra. The number of repeat examinations was limited both by lack of cooperation by the women, and by the termination of compulsory examination. The authors consider their percentage of positive results to be lower than the true incidence of trichomoniasis in prostitutes.

In contrast to the incidence in prostitutes, trichomonads were found in only 10 of a large number of "virgins" examined. Even these 10 cases seemed to be a serious argument against venereal transmission of this parasite, until careful questioning revealed that 7 of the 10 infected individuals had experienced incomplete intercourse of some sort.

These results indicate that the usual transmission of Trichomonas vaginalis is by sexual intercourse, and that nonvenereal infection by this organism is rare.

—Elmer V. Dahl, M.D.

Therapy of the Adrenogenital Syndrome in Females (Zur Therapie des adrenogenitalen Syndroms der Frau). A. WÜRTERLE. *Geburtsh. & Frauenh.*, 1958, 18: 906.

THE UNDERLYING FACTOR of the congenital adrenogenital syndrome with adrenal hyperplasia is a blockage of hydrocortisone biosynthesis. This deficiency causes androgenic metabolites to appear which incite the pituitary to release ACTH and this in turn stimulates the abnormal steroid production as part of this abnormal biosynthetic process. An increase of androgenic steroids depresses the gonadotropins of the anterior pituitary, leading to an ovarian insufficiency. A similar situation is encountered in the adrenogenital syndrome caused by adrenal tumors that secrete androgenic steroids.

The most obvious abnormality of adrenal hyperplasia is an increased production of adrenal steroids raising the urinary 17-ketosteroid and pregnanediol output. Androgenic tumors of the adrenal will also cause an excessive urine excretion of 17-ketosteroids but an increased urinary dehydroisoandrosterone content is especially characteristic. The characteristic enzymatic defect in adrenal hyperplasia is a lack of C-21-hydroxylase. The critical step in the biosynthetic chain leading to hydrocortisone is at the weakly androgenic 17-hydroxyprogesterone level. C-21 and C-19 degradation products from this point on, and especially androsterone, have a potent androgenic effect. In adrenal hyperplasia cortisone depresses the production of such elements and also brings about the return to normal of the deranged ovarian function and the state of defeminization. As the androgenic function of adrenal tumors is autonomous, no amelioration by cortisone can be expected. Surgical extirpative therapy is then the only solution, whereas adrenal hyperplasias are amenable to steroid substitution therapy.

The excellent therapeutic effect of cortisone, prednisone, and prednisolone in patients affected by adrenal hyperplasia causing the adrenogenital syndrome is described.

The diagnosis was established in these patients from the typical clinical findings by the demonstration of increased adrenal size on the roentgenogram using retroperitoneal air insufflation, and by the increased 17-ketosteroid urinary excretion which reverted to normal after the administration of cortisone.

The first patient was 18 years old and amenorrheic. With a daily maintenance dose of 2.5 mgm. of prednisolone normal menstrual periods ensued, facial and abdominal hypertrichosis receded, and the breasts developed to a respectable size. The excretion of 17-ketosteroids returned to normal in this and the subsequent patients. The second patient was a 27 year old female, of virile body type with a beard, deep voice, and atrophic breasts. After the excision of a hypertrophic clitoris the right adrenal was resected because of a roentgenologically suspected adrenal tumor. Only a hyperplastic adrenal was removed and even though the excretion of 17-ketosteroids decreased, significant elevation persisted. The presence of contralateral adrenal hyperplasia was established with the aforementioned cortisone test. Cortisone substitution therapy (50 to 75 mgm. daily) maintained normal 17-ketosteroid levels in the urine but menstruation did not return and refeminization did not occur. Twenty-seven days after a dose of 5 mgm. of prednisolone daily was initiated, normal menstrual periods started and refeminization subsequently was observed. In the third patient occasional menstruation occurred when 75 mgm. of cortisone were given daily. After side effects due to the cortisone appeared, a dose of 5 mgm. of prednisolone was substituted; this drug was effective in maintaining regular menstrual bleeding periods which persisted for some time even after discontinuance of therapy. Aside from hirsutism and a deep voice, the fourth patient had no other symptoms of the adrenogenital syndrome; even nonovulatory menstrual periods were present. On maintenance with 2.5 mgm. of prednisolone an ovulatory cycle returned and the other symptoms disappeared.

The authors conclude that in adrenal hyperplasia resectional therapy is contraindicated. Even with near total adrenalectomy cures will not be achieved. The therapy of choice is medical since maintenance with prednisolone cured 4 out of 4 patients in this series. The dosage was dictated by the 17-ketosteroid urine level which was maintained within normal limits. Prednisone and prednisolone have a definite advantage over cortisone. Their potency is 3 to 5 times greater; they are void of side effects, and since such therapy has no influence on electrolyte and water balance, no special dietary management is necessary.

—Karel B. Absolon, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Tubal Pregnancy; Pathologic Analysis of 300 Cases. HU CHIH-YUAN and CH'ENG FENG-K'UEI. *Chin. M. J.*, 1958, 76: 517.

A STUDY was made of the pathologic material removed in 300 cases of tubal pregnancy and also tubes removed at postpartum tubal ligation. The cases were obtained from the Second Military Medical College Hospital and the Shanghai Fourth Municipal Hospital. Included in the study were tissues other than the ectopic which might be removed at the time of the operation, in addition to curettings. The patients studied varied from 19 to 43 years of age. Clinical findings were similar to those reported elsewhere. Approximately 40 per cent of the patients had a history of one child sterility and the husbands of 30 per cent of the patients had a history of venereal exposure. The location of the ectopic gestation was predominantly in the ampullar region of the tube; 70 per cent of the ectopic gestations were located in this area, 20 per cent were in the isthmic region of the tube, and the remainder were in the interstitial portion of the tube. Seventy-three per cent of the ectopic gestations had ruptured.

Decidual changes were noted in 38 per cent of the endometrial specimens obtained, and secretory and proliferative endometrium was noted in 53 per cent. There was a relationship between the presence of decidua and the duration of vaginal bleeding. If the vaginal bleeding was of short duration decidual changes were likely to be noted. Decidual changes in the tube were found in only 18.7 per cent. In the sections of tubes removed for postpartum tubal ligation the incidence of decidual changes was noted to be 10 per cent. Tubal ligations were performed by the Pomeroy technique 24 hours postpartum. The eosinophilic fluid in the lymphatics of the tube, as described by Hellman, was noted in 12 per cent of the cases of tubal pregnancy. The epithelial cells of the serosa were predominantly normal; however, in 70 cases of perisalpingitis the cells were all noted to be tall cuboidal or columnar. Sixty-three per cent of the tubes removed because of ectopic pregnancies were noted to be associated with follicular salpingitis. In all cases in which the opposite tube was also removed, they were found to be infected. Other factors relating to the etiology were noted less commonly, such as pseudoglandular formation, perisalpingitis, tuberculous salpingitis, corpus luteum in the opposite ovary, accessory tube, and other factors.

Factors considered of prognostic value were the presence of hydrosalpinx and acute salpingitis, both of which were felt to increase the risk of ectopic pregnancy. Venous thrombosis was found in 25 cases and was considered as a possible explanation for shock associated with some tubal pregnancies. Viable chorionic villi were noted in 29 cases. These cases usually had positive pregnancy tests whereas the ectopic pregnancies associated with evidence of degeneration or only trophoblastic cells as a rule yielded a negative test. —*James F. Donnelly, M.D.*

The Diagnosis and Significance of Minor Degrees of Uterine Abnormality in Relation to Pregnancy. DAVID HAY. *J. Obst. Gyn. Brit. Empire*, 1958, 65: 557.

REPEATED INTRAUTERINE manual examination by the author led him to the conclusion that minor abnormalities of the structure of the uterus occurred more frequently than were acknowledged. Sixty-five cases of uterine abnormality associated with pregnancy were diagnosed and confirmed by roentgen examination during an 18 month period from July, 1954 until December, 1955, at the St. Davis Hospital, Bangor, North Wales. There were 54 cases of subseptate uterus, 3 of bicornuate uterus, 4 of severe subseptate uterus, 3 of arcuate uterus, and one case of uterus unicornis. The diagnostic criteria used by previous authors were found to be inadequate. The criteria used by the author, in the order of importance, are as follows:

1. Fetal limb flanking with overlie.
2. Breech flanking with contralateral limb flanking.
3. Fetal limb flanking with fundal notching.
4. Broad fundus with fundal notching.
5. "Cystic" formation of the uterus.
6. A positive Piscacek's sign in early pregnancy.
7. A persistent breech presentation.
8. Axial deviation of the uterus or fetus without limb flanking.
9. Notching or dimpling of uterine fundus only.
10. Recurring breech presentation requiring version.
11. Free head at term in a primigravida in the absence of disproportion and other accepted causes.
12. Recurrent transverse lie.
13. Obstetric history, e.g., recurrent abortion, breech delivery.

The first seven criteria were considered to have a diagnostic value of 100 per cent. The clinical data are given to support this contention. Many of these diagnostic criteria are related to departures from the normal attitude of a fetus in complete flexion with the limbs in close approximation to the trunk. Abnormalities in the shape of the uterus may be noted even early in pregnancy. A number of patients who were thought to be normal on the basis of clinical findings were subjected to roentgen examinations later; only one of them was found to have an abnormal hysterosalpingogram.

The exact incidence of the condition is hard to determine for a variety of reasons. The selection of patients could not be avoided since the patients who obviously had abnormalities either of labor or of the third stage of pregnancy were more likely to be included in the study. It was also noted that the patients who had the most diagnostic or therapeutic procedures carried out in the hospital were more likely to return for follow-up roentgen examinations. Thus many patients who had normal labors but were suspected of having an abnormality of the uterus failed to return for follow-up confirmation.

TABLE I.—COMPLICATIONS DUE TO UTERINE ABNORMALITIES

	No. of Cases	*Per cent*
Abortion	15	13.1
Forceps	12	10.5
Cesarean section	13	11.4
Retained placenta	14	12.3
Transverse lie	4	3.5
Postpartum hemorrhage	3	2.6
Placenta praevia	2	1.8
Inco-ordinate uterine action	8	7.1
Free head at term	11	9.0

Hysterographic techniques were standard with the uterus being pulled down by cervical traction in order to obtain the best outline of the uterine fundus. There was no clearcut line between the normal and abnormal roentgen findings and it is necessary to correlate the clinical findings, particularly those noted on intrauterine palpation, with the findings of hysterography. More important, perhaps, is the observation that a grossly abnormal uterus may behave in a completely normal pattern. The conclusion was reached that bilateral pocketing in the uterus after delivery was the most reliable finding on which to base standards on uterine behavior.

The 65 patients with proved uterine abnormality had between them 114 pregnancies with the complications shown in Table I.

The 23 multiparous patients who had had a total of 61 pregnancies were further examined and the incidence of abortion, previous cesarean section, retained placenta, transverse lie, and breech presentation was noted to be high. There were 32 cases of primigravid patients with vertex presentations. Uterine abnormality was suspected on the basis of prenatal findings. Again it was noticed there was a high incidence of complications with only 65 per cent of the confinements considered normal. The results noted in this group are subject to some statistical doubt since many of the primigravidas who had had no difficulty during labor returned for subsequent roentgenographic studies.

The usually accepted incidence of breech delivery in term infants is approximately 3 per cent. Among the 23 multiparous patients the incidence of breech delivery in this series was 6.5 per cent, or twice as high as in the general hospital population.

In retrospect the author had noted bilateral pocketing of the uterus for many years in association with breech presentations and he concludes that extended breech presentation is almost diagnostic of uterine abnormality. Since extended legs occur rather frequently in normal uterine pregnancy it appears that the fetus with extended legs tends to remain in breech position rather than shifting to the vertex position at or about 34 weeks as it would in a normal uterus.

Cystic formation of the uterus was noted particularly in the early and late weeks of pregnancy by other workers. Abortion was said to occur much more commonly in the abnormal uterus, the incidence varying from 24 to 71 per cent. It is obvious, however, that these percentages are based upon highly selected material.

Forty-three multiparous patients who had had complete studies, including roentgen studies of the intrauterine cavity, were examined according to their previous obstetric history. The incidence of abortion in this small group was 7 per cent in contrast to the 24 per cent abortion rate noted in the 23 multiparous patients known to have abnormalities of the uterus. The incidence of retained placenta was higher among this group than would be anticipated and it was felt that the abnormal shape of the uterus was the primary etiologic factor. Nine per cent of the primigravidas were found to have a floating head at term. A floating or free head in a primigravida after the thirty-seventh week and after other causes of such a condition are eliminated is considered by the author as highly suggestive of uterine abnormality. Inco-ordinate uterine action was frequently noted, particularly among the primiparas. The incidence of toxemia of pregnancy was noted to be 18 per cent, considerably higher than the hospital population in general. Discussing the current classifications the author points out that there is a total lack of correlation between the exterior appearance of the uterus and the internal contour, particularly immediately postpartum. A uterine septum may not always remain following pregnancy and in some cases that have been observed the septum appeared to be more or less taken up by the growth of the uterus, resulting in one cavity where two had existed previously. —*James F. Donnelly, M.D.*

An Evaluation of Chlorothiazide in the Treatment of Edema in Pregnant Women. LEON C. CHESLEY and LEOPOLDO UICHANCO. *Am. J. Obst.*, 1958, 76: 467.

DIURETIC AGENTS have played an important part in the empiric treatment of pregnancy toxemia. This report presents an evaluation of a new diuretic sulfonamide, chlorothiazide, (6-chloro-7-sulfamyl-1, 2, 4 benzothiadiazine-1, 1-dioxide). The evaluation of diuretic drugs in pregnant women with edema poses some peculiar difficulties. When these women are hospitalized and kept on a low-sodium intake, they typically lose weight, water, and sodium for a week to 10 days and may become edema free with no other treatment (unless they have severe pre-eclampsia). While this is often true in nonpregnant edematous patients as well, the effect is more marked in pregnant women. In pregnancy the venous pressure (and therefore the capillary pressure) is considerably increased in the legs, thus favoring the filtration of fluid out of the vascular system, especially when the patient is up and about.

With bed rest the venous pressure in the legs decreases, thus favoring reabsorption of the interstitial fluid, and in normal pregnancy the volume of night urine may exceed that of the day. Bed rest is one of the best diuretics in pregnant edematous women. The clinician's impression as to the efficacy of a diuretic drug is often confused by the fact that his patient is almost simultaneously hospitalized, a low sodium intake is prescribed, and administration of the drug begun; the prompt weight loss is then attributed to the drug.

In pregnant edematous women, bed rest and dietary sodium restriction alone have a good diuretic effect. Negative sodium balances are maintained for several days. Chlorothiazide stimulates sodium and chloride excretion in pregnant edematous women, after the

major effect of bed rest and a low-sodium diet has occurred. The resistance to chlorothiazide develops progressively from day to day. It seems to disappear after a rest period of 3 days (possibly less).

—*John R. Wolff, M.D.*

LABOR AND ITS COMPLICATIONS

Elective Induction of Labor; Dilute Intravenous Pitocin and Amniotomy in 2,084 Patients. HARRY FIELDS. *Obst. Gyn.*, 1958, 12: 276.

ELECTIVE INDUCTION of labor with dilute pitocin administered intravenously and amniotomy was performed in 2,084 patients during the 6 years, 1950 to 1955, at the Hospital of the University of Pennsylvania. Ninety-five per cent of the patients were private patients; 1,500 were multiparas, and approximately 500 were primigravidas. The reasons for induction were to prevent uncontrolled delivery prior to or immediately upon arrival at the hospital, to prevent anesthetic accidents during delivery, to provide assurance for all concerned that the patient's obstetrician would be available throughout labor and delivery, and to maintain orderly maternity-bed occupancy in the hospital for the comfort of the patient. Labor was less than 10 hours in 95 per cent of the cases. The vast majority of deliveries was either spontaneous or accomplished by low forceps. There were 77 indicated midforceps deliveries.

Eight patients were subsequently delivered by cesarean section as the result of complications which occurred after induction was started or became apparent. These included 2 cases of cephalopelvic disproportion, one of cervical dystocia, one of oblique presentation, one of premature separation of the placenta, and one of fetal distress. There were 4 neonatal deaths, one attributed to anoxia secondary to poor anesthesia, one due to hyaline membrane disease, and 2 due to congenital malformation. A number of complications were encountered which included uterine spasm with depression of the fetal heart rate in 27 cases. There were 24 cases of postpartum hemorrhage noticed in the first part of the series from 1950 to 1952, an incidence of 3.1 per cent. Continuation of the pitocin throughout labor, delivery, and the early part of the third stage resulted in a considerable reduction in this figure. Prolapse of the cord followed rupture of the membranes in 2 cases.

Poor response to pitocin was noted occasionally. Sometimes this was attributed to pitocin itself, other times it was felt that the patient was not ready for induction. Disturbance of uterine motility was also noted in some patients who responded well initially to pitocin, following which there was a reduction in the progress of labor and this responded to ample sedation and very well to caudal anesthesia. Bleeding that was considered to be due to partial separation of the placenta was noted in 18 patients; cesarean section was required in one case. Forty-one of the 2,100 infants delivered weighed less than 2,500 grams, the smallest weighing 1,840 grams. Only 4 infants weighed less than 2,000 grams, however. An outline of the technique of induction is included; the importance of careful close management is stressed.

—*James F. Donnelly, M.D.*

Case for Induction of Labor in Treatment of Hemolytic Disease of the Newborn. G. A. KELSALL, G. H. VOSS, and R. L. KIRK. *Brit. M. J.*, 1958, 2: 468.

THE USE of controlled induction of labor, followed by prompt and adequate exchange-transfusion, has a definite place in the treatment of hemolytic disease of the newborn.

The indirect antiglobulin titer of the maternal serum provides a reliable guide in the management of the Rh case.

Regular weekly or fortnightly tests of the serum of all Rh-negative mothers should be begun not later than the twenty-sixth week of pregnancy. If antibodies are present an antibody titration should be carried out.

If the indirect antiglobulin titer remains at or below 1/64 the pregnancy can be allowed to proceed to spontaneous termination, and the infant can be left untreated.

If the titer is higher than 1/128 at the time of delivery the infant should have an exchange-transfusion promptly, but if the titer at the time of delivery is 1/128 some discretion may be exercised. When the cord-blood hemoglobin is high and no free Rh antibody is present in the cord serum the infant can be left untreated initially. If there is any doubt about the outcome, however, it is always better to carry out the exchange-transfusion.

The pregnancy should be terminated at the thirty-fifth to thirty-sixth week if the titer at that time is 1/512 or higher. The longer the titer has been at 1/512 or higher the more urgent is the need for induction of labor and prompt exchange-transfusion. If the titer is 1/128 or 1/256 induction is indicated at the thirty-seventh to thirty-eighth week. The longer the titer has been at these values the earlier the need for induction.

—*John R. Wolff, M.D.*

Delivery Before Full Dilatation with Special Reference to Incision of the Cervix. D. H. BLAKEY, C. J. DEWHURST, and C. S. RUSSELL. *J. Obst. Gyn. Brit. Empire*, 1958, 65: 644.

DELIVERY of a child prior to full dilatation can be accomplished either by cesarean section or incision of the cervix. The records of the Jessop Hospital and the University Unit at the City General Hospital in Sheffield, England, since 1951, have been reviewed. Out of a total of 12,000 deliveries there were 44 cases of incision of the cervix. No serious maternal complications were noted and no fetal loss was attributed to the method of delivery. Nearly half of the infants weighed between 8 and 9 pounds.

The operation is considered safe provided that certain conditions are satisfied prior to the performance of the procedure. The head must be deeply engaged and preferably reach the pelvic floor. The vaginal vault must be fully dilated. The cervix must be thin and the vagina below the presenting part distensible. Finally the bony pelvic outlet must be adequate and there must be no other evidence of disproportion. Incisions are made at three and nine o'clock, since this is the region at which the cervix usually tears spontaneously and since it is safe from the possibility of extension with damage to the bladder and rectum. There appear to be four main indications for the pro-

cedure: (1) prolonged labor with impending maternal distress, (2) cervical dystocia, (3) fetal distress with prolapse of the cord, and (4) prolonged labor after fetal death. Sixteen of the 44 patients were seen for follow-up examinations, and 5 have had a subsequent pregnancy, all without difficulty. Healing appeared to be normal in all the patients seen.

The procedure has been condemned in recent years by many authors. The reason appears to be that incision of the cervix was often used when the necessary conditions for its safe use were not fulfilled. It is important that the greatest diameter of the fetal head should have already passed below the condensation of fascial tissue surrounding the cervix and the upper vagina. Although the degree of dilatation is not essential it is important that the cervix be thin; the rim of the external os may be thick, but the cervix above it should be thin. Disproportion must be carefully excluded. The procedure is recommended only for those well accustomed to perform difficult vaginal deliveries, and even then must be done only when the best facilities are available.

—James F. Donnelly, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Perigenital Hematomas: Analysis of 47 Consecutive Cases. LUCIANO S. J. SOTTO and ROBERT J. COLLINS. *Obst. Gyn.*, 1958, 12: 259.

A HEMATOMA around the birth canal can be one of the most distressing and unpleasant complications for the parturient. If not recognized or treated properly, serious sequelae, such as hemorrhage, shock, infection, and even death, can occur.

Hematomas in this area are classified into four types: (1) vulvar, those involving chiefly the vulva or the perineum or both; (2) paravaginal, those confined chiefly to the walls of the vagina; (3) vulvovaginal, those involving both the vulva and the vagina; and (4) supravaginal, those situated above the vaginal vault.

Hematomas occurring in 47 patients are reported. This figure represents an incidence of 1 in 309.5 deliveries.

Etiologic factors include trauma as the most important factor. The trauma may be sudden or gradual, resulting from pressure necrosis. Improper hemostasis at the time of episiotomy repair is another major factor responsible in many cases.

Systemic factors have also been implicated in the formation of hematoma. Lack of elasticity of the soft tissues in primiparas is a factor. Toxemia due to vascular damage accompanying hypertension is another factor along with blood dyscrasias, varicosities of the genital tract, large babies, too vigorous uterine massage, persistent occipitoposterior fetal position, and prolonged second stage of labor.

The methods of treatment are conservative or surgical. The former consists of applying continuous pressure with ice packs for the first 24 hours, followed by application of heat, and packing the vagina with gauze. The latter method consists of evacuation of the hematoma and ligating bleeding vessels or suturing the bleeding areas, obliteration of the cavity by suture, and resuture of the episiotomy followed by tight vaginal packing.

—Harry Fields, M.D.

MISCELLANEOUS

Cullen's Sign: A Historical Review and Report of Histologic Observations. JAMES A. MERRILL. *Obst. Gyn.*, 1958, 12: 276.

CULLEN'S SIGN consists of ecchymotic discoloration of the periumbilical skin and subcutaneous tissues and was first described in association with ectopic gestation and intraperitoneal hemorrhage.

Sixty cases of Cullen's sign were collected from the literature of which 33 were associated with ectopic gestation. Three new cases are presented. In 2 cases the periumbilical discoloration was associated with vaginal hematomas, and in one case, with ectopic gestation and hemoperitoneum.

A biopsy of the area of Cullen's sign is described. The significant findings are diffuse extravasation of intact blood and small amounts of hemosiderin pigment.

Theories of the formation of Cullen's sign are discussed. The presence of abnormal apertures or breaks in the continuity of the peritoneum is suggested as the most acceptable theory. The duration of the collection of colored fluid may be of importance.

—Harry Fields, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Idiopathic Hypercalciuria. PHILIP H. HENNEMAN, PATRICIA H. BENEDICT, ANNE P. FORBES, and H. ROBERT DUDLEY. *N. England J. M.*, 1958, 259: 802.

MANY RECURRENT KIDNEY STONES are found in patients with no obvious etiology demonstrable. Many of these patients have an increased urinary calcium excretion without the elevated serum calcium level found in hyperparathyroidism. Hypercalciuria can come from hyperparathyroidism, active osteoporosis, Cushing's syndrome, a high intake of calcium, vitamin D therapy, sarcoidosis and beryllium poisoning, renal osteomalacia, metastatic cancer, multiple myeloma, and ACTH and/or corticoid therapy. The authors point out a condition in which the cause of the hypercalciuria is not as yet clear, hence, the suggested term "idiopathic hypercalciuria." It is emphasized that a definitive differential diagnosis between idiopathic hypercalciuria and mild hyperparathyroidism cannot be made unless the neck has been explored and all four parathyroids found to be normal.

The selection of cases to be grouped under this classification was difficult; cases with negative parathyroid explorations and cases with normal serum calcium value were accepted. These cases were then compared with the 14 cases of hyperparathyroidism having the lowest serum calcium levels. The results of these comparisons showed that lower average serum calcium levels and higher urinary calcium excretion were noted in patients with idiopathic hypercalciuria. Also the average serum phosphorus in these patients was very nearly the same low value as found in the 14 cases of hyperparathyroidism.

Other findings in these patients with idiopathic hypercalciuria were: (1) nearly 100 per cent had had urinary tract infection at some time, (2) all 32 of the patients were males, (3) on chemical analysis the stones found in these patients were very similar to those in hyperparathyroidism, and (4) administration of alkali failed to decrease the calcium excretion in contrast to findings in tubular acidosis.

Sodium phytate, 8.8 gm. daily, reduced the calcium absorption and urinary calcium to normal levels in 9 of 10 cases for prolonged periods and 8 of these patients had no further stone growth.

—*John R. Herman, M.D.*

Ureterocele in Childhood. MELBOURNE H. LENT, IMRE V. MAGOSS, and FREDERICK D. MITCHELL. *N. York State J. M.*, 1958, 58: 2935.

THE DIAGNOSIS and treatment of ureterocele is not difficult and the condition yields to simple treatment if recognized early. It may cause pronounced symptoms and extensive renal tissue damage in undetected cases. This is especially true in children in whom kidney damage may be extensive before the condition is brought to the urologist's attention.

A review of the literature is presented and most authors concur that ureterocele is a congenital defect with the basic etiologic factors being stenosis and weakness of the ureter. Some authors agree that this defect may be acquired.

The pathology of ureterocele is characterized by partial ureteral obstruction which gradually produces hydroureter and hydronephrosis. Complete destruction of the kidney may result. Infection, as in any urinary obstruction, is frequent. The pathologic findings of a small ureterocele are limited to the affected ureter and kidney. A large ureterocele, in addition, may obstruct the opposite ureteral orifice or prolapse into the urethra, causing bladder neck obstruction.

Clinically, ureterocele presents no characteristic symptoms. It is generally discovered unexpectedly during a complete urologic examination. At cystoscopy, a thin-walled, cystlike structure is seen in the region of the ureteral orifice. This structure rhythmically expands with urine under peristaltic pressure, then collapses as the urine slowly escapes through the small ureteral orifice.

Excretory urogram findings may be highly suggestive of ureterocele. If the ureterocele fills with dye, it appears as a bulbous structure surrounded by a halo. If the affected kidney is malfunctioning, the ureterocele will appear as a smooth walled filling defect in the bladder.

Four cases in children are presented in one of which the disease was diagnosed and treated several days after birth. —*Edward J. Frishwasser, M.D.*

Comparative Studies of Tuberculin Cytolysis in Urogenital Tuberculosis (Vergleichende Untersuchungen zur Tuberkulinzytolyse bei Urogenitaltuberkulose). W. KANZLER. *Zschr. Urol.*, 1958, 51: 377.

LEUCOCYTES OF TUBERCULOUS INDIVIDUALS are sensitive in vitro to tuberculin, and under certain circumstances undergo cytolysis. This phenomenon is a corollary of cutaneous tuberculin reactions. However, the test may be positive one day and negative the next day and, moreover, cytolysis may occur also in nontuberculous individuals.

Experiments on a limited material showed that leucocytes obtained from the urine of patients with urogenital tuberculosis are not sensitive in vitro to tuberculin. Cytolysis of such leucocytes, which took place after the addition of serum from normal individuals, was not intensified, but rather inhibited by the addition of tuberculin. The author attempted to transfer the substance, which possibly is present in the urinary sediment and forms a cytolyzing agent with tuberculin, to a fresh suspension of leucocytes from the blood of a normal individual. In all cases of urogenital tuberculosis cytolysis of tuberculin took place, whereas it was not observed in control cases of nonspecific pyuria. However, repeated examinations sometimes gave the opposite results, namely, cytolysis without tuberculin, and inhibition of it by tuberculin. The author worked out a hypothesis, according to which the original sensitivity is replaced by immunity under the influence of tuberculostatic therapy.

The author concludes from his experiments that cytolysis of urinary leucocytes is found in untreated cases of urogenital tuberculosis. If the treatment is successful, spontaneous cytolysis in vitro is frequently inhibited by the addition of tuberculin. This phenomenon points to the regression of a specific focus. Occasionally false negative results are observed and are attributable to the fact that urinary cytolysis and its inhibition may neutralize one another.

The results are negative in recent or progressive cases of pulmonary tuberculosis with normal kidneys, while inhibition of cytolysis is noticed in regressive conditions. —*Joseph Narat, M.D.*

Kidney Transplantation Between Seven Pairs of Identical Twins. JOSEPH E. MURRAY, JOHN P. MERRILL, and J. HARTWELL HARRISON. *Ann. Surg.*, 1958, 148: 343.

KIDNEY TRANSPLANTATION from one to the other of identical twins, first performed in 1955, has been performed in 7 instances to date. Permanent function of a transplanted vascularized organ is possible between monozygotic (identical) twins by virtue of a genetic constitution which is identical gene for gene. By contrast, transplantation between other human beings has failed after a variable period of function, presumably because of an antibody response of the recipient against the nuclear antigen of the donor. The kidney as an example of a homovital graft requiring parenchymal cellular survival for function must be distinguished from homostructural grafts of cornea, blood vessels, or bone which function only as a framework for recipient tissues. The experience with 23 kidney transplantations at the Peter Bent Brigham Hospital, in Boston, Massachusetts dates back to 1945. The longest period of function of these unrelated transplants was 5.5 months. Donors were cadavers or hydrocephalic children undergoing nephrectomy for ureteroarachnoid anastomoses. The donor must have normal bilateral renal function, be uninfected, have a normal lower urinary tract, and have sufficient understanding of the significance of a unilateral nephrectomy.

The recipient must be in a terminal state of irreversible uremia and have a normally functioning lower urinary tract. A malfunctioning lower tract might ultimately impair the transplanted kidney. Infection, if present, should be minimal or controllable, and the primary renal disease should be inactive. Ideally all these conditions should be fulfilled. However, as the only lifesaving procedure, transplantation has been done in the presence of infection or active primary renal desease.

To prove genetic and immunologic identity all candidates for transplantation are cross skin grafted and the blood types are matched for all known blood groups. Final proof is the presence of a nonreactive skin graft on the healthy donor after 3 weeks.

Careful legal permission for the procedure is important.

Seven case histories are presented and the operative technique is described.

All donors are living and well without disability. In 6 of the 7 recipients functioning transplants developed with the biochemical changes of uremia returning to normal. Except in one instance, the flow of urine began immediately and continued in excessive quantities until all signs of renal and cardiac failure were rectified. In one recipient function did not develop and the patient died 12 days after the transplantation. Of the 6 who had return of normal function, as shown clinically, chemically, and by roentgenogram, one died 4 months after the operation when the transplanted kidney became involved with the patient's original desease. Another patient, who is still living, has signs and symptoms suggestive of active disease in the transplant.

Four other patients are alive and well, the longest period being 3.5 years after transplantation. One recipient successfully completed a normal pregnancy 18 months after the transplantation.

—*Edward J. Frishwasser, M.D.*

Stricture of the Ureter and Contracture of the Bladder and Bladder Neck Due to Tuberculosis: Their Diagnosis and Treatment. W. A. MOONEN. *J. Urol.*, Balt., 1958, 80: 218.

IN THIS ARTICLE the author discusses the complications of healing tuberculosis of the ureter and bladder. Strictures of the ureter, usually but not always located in the distal third, were seen during treatment of genitourinary tuberculosis. These occurred both in the ureter draining the obviously tuberculous kidney and in the apparently normal contralateral ureter following excision of a tuberculous kidney. Illustrative case histories of patients who developed a ureteral stricture are presented; symptoms ranging from intermittent flank pain to acute anuria signaled the presence of the stricture. Treatment in the cases presented included cutaneous ureterostomy and reimplantation of the ureter into the bladder. In instances in which the ureteral stricture was associated with contracture of the bladder, implantation of the ureter in an ileal loop was employed. This type of procedure is suggested for strictures of the middle and upper parts of the ureter. The author points out that scarring occurring with healing tuberculosis may result in a patulous as well as a stenotic ureteral orifice and may thus lead to reflux.

In addition to ureteral stenosis, cicatrization associated with healing of tuberculosis may result in a contracted bladder and/or a contracted vesical neck. Both of these complications may be associated with, and contribute to, ureteral reflux. Surgical intervention is indicated in the presence of a contracted bladder to alleviate symptoms and prolong life. In patients with ureteral reflux associated with a contracted bladder the author ignores the ureter and attempts to increase the bladder capacity by employing a simple ring ileocystoplasty. In addition, a wedge excision of the vesical neck or a subsequent transurethral resection of the neck is carried out. In the patients with a ureteral stricture in addition to a contracted bladder, the ureter is severed and reimplanted in the ileal loop. The case histories of 9 patients subjected to ileocystoplasty are presented. The procedure employed was uniformly successful in alleviating symptoms and preserving renal function during the period of observation. Complications of interest were the development of hyperchloremic

acidosis in 2 of the patients reported and the discovery of vesical calculi postoperatively in 3.

Contraction of the vesical neck as the result of scarring was found to lead to residual urine and its complications in the tuberculous patient. Occasionally the contracture has been severe enough to lead to acute retention; occasionally a persistent nontuberculous cystitis focused attention on the possibility of residual urine. As a rule transurethral resection of the bladder neck is indicated to relieve significant obstruction. In patients with ureteral reflux, the author presumes some degree of vesical neck obstruction and routinely makes an effort to correct this.

—*John T. Grayhack, M.D.*

GENITAL ORGANS

Metastatic Carcinoma of the Prostate and Bleeding. Ian A. Kellock and Niall Gallagher. *Brit. M. J.*, 1958, 2: 487.

The authors reported a case of metastatic carcinoma of the prostate with a hemorrhagic diathesis secondary to a circulating fibrinolysin and contrasted it with another case with thrombocytopenia and bleeding secondary to involvement of the bone marrow. Therapy with stilbesterol alone caused the fibrinolysis to disappear with subsequent improvement of the fibrinogen level and the prothrombin time. A transurethral biopsy and prostatectomy were carried out during estrogen control. No correlation was found between the occurrence of fibrinolysis and the level of acid phosphatase in the serum.

—*Robert Turell, M.D.*

Modification of Millin's Retropubic Prostatectomy (Ueber eine Modifikation der retropubischen Prostatektomie nach Millin). H. Dettmar. *Zschr. Urol.*, 1958, 51: 402.

Incomplete hemostasis after Millin's retropubic prostatectomy may produce an obstruction of the retention catheter which, if not recognized promptly, may lead to distention of the bladder, incontinence of the suture line, considerable pain, and absorption of toxic material with resulting elevation of the temperature.

To avoid such complications, the author has developed a method which allows a complete separation of the prostatic bed from the lumen of the bladder, so that no coagulum can plug the catheter.

The prostatic gland is exposed through a low transverse incision, and hemostasis is accomplished by electrocoagulation. The prostatic capsule is incised in the longitudinal direction. After enucleation of the prostatic gland a Foley catheter is introduced into the bladder. Both flaps of the bladder neck are sutured together with a continuous fine catgut stitch, which accomplishes perfect hemostasis. Care must be taken to include in the region of the trigonum only a few millimeters of the bladder mucosa to avoid distortion or closure of the ostia. The prostatic capsule is sutured with a continuous stitch of heavy catgut so that the prostatic bed is plicated in the physiologic direction.

Contrary to Harris-Hryntschak's method, the extravesical approach to the adenoma through the capsule is employed. This procedure facilitates the toilette of the prostatic bed and avoids its plication in the nonphysiologic longitudinal direction.

This method was successfully employed in 75 patients. Irrigations 2 or 3 times a day were sufficient. Aspiration of blood coagula was not required and elevation of the temperature was inconspicuous or absent. Strictures can be avoided by the use of very fine suture material. —*Joseph Narat, M.D.*

The Pathogenesis and Treatment of Primary Hydroceles in Infancy and Childhood. Douglas G. McKay, R. Fowler, and J. S. Barnett. *Austral. N. Zealand J. Surg.*, 1958, 28: 1.

The authors divide hydroceles of infancy and childhood into primary and secondary hydroceles. The former include those of congenital origin in which a macroscopically obvious communication with the peritoneal cavity allows free passage of peritoneal fluid into the hydrocele sac, and the idiopathic hydrocele in which no such cause for the fluid accumulation is obvious. Secondary hydroceles are the result of disease of the testis or its adnexae.

They state that all primary hydroceles of childhood are congenital in origin and result from the distension of a patent processus vaginalis with peritoneal fluid. In support of their views they present data concerning more than 100 cases of hydrocele in infancy and childhood. In the majority of cases, careful dissection will demonstrate a communication between the hydrocele and the peritoneal cavity. Furthermore, in the minority of cases in which such a communication could not be demonstrated (noncommunicating hydroceles) a patency of at least the proximal part of the processus vaginalis was observed.

The authors advance the following evidence in support of their thesis concerning the congenital nature of this condition:

1. The right-sided preponderance that is typical of hernias and undescended testes was likewise found for hydroceles.

2. A history was usually elicited, even in the apparently noncommunicating cases, of intermittent variation in the size of the hydrocele at some stage in its life history.

3. The fluid from both communicating and noncommunicating hydroceles was microscopically and chemically indistinguishable from peritoneal fluid.

4. Imprisoned hydrocele fluid was shown to be reabsorbed from both communicating and noncommunicating cases after simple operative ablation of a patent funicular process.

5. If the hydrocele was left behind, emptied of its fluid with only a needle puncture or minute incision in its walls, reaccumulation of such hydrocele fluid did not occur after severance of the funicular process or strand.

6. Recurrent hydroceles in children were always associated with a fine patent processus which had been overlooked at the original operation. Severance of this fine processus cured the condition.

The authors suggest the following management of hydroceles in infancy and childhood. In view of a strong tendency toward spontaneous cure, surgical interference is usually not indicated during the first year

of life for the hydrocele itself; other complications such as hernia may necessitate surgical treatment. Simultaneous evacuation of the hydrocele by aspiration or minute incision avoids waiting for the reabsorption of fluid which has been shown to follow ablation of a patent processus. The more extensive interference with the hydrocele sac inherent in orthodox surgical procedures is unnecessary.

—*Laurence F. Greene, M.D.*

Seminoma of an Intra-Abdominally Retained Testicle Which Had Undergone Peduncular Torsion (Sul seminoma del testicolo in ritenzione abdominale e torto sul peduncolo). NICOLA CORTESI. *Arch. ital. urol.*, 1958, 31: 226.

A PATIENT WITH cryptorchidism, 26 years old, who had always been in excellent health, suffered a sudden nocturnal attack of right lower abdominal pain and was admitted on the emergency service. The pains were localized and very severe; the right lower abdominal wall was contracted and extremely painful to palpation.

Abdominal exploration disclosed a firmly elastic, reddish-brown, extraperitoneal tumor which was rather easily isolated and involved the right testicle. The pedicle was short and twisted upon itself 3 times.

The testis, epididymis, and lumboaortic lymph glands were removed. Operation was followed by roentgen therapy. Two months later the patient was in good health and without clinical or roentgenological evidence of metastasis.

The tumor was the size of an orange with an irregular surface. The cut surface was brownish-red in color with extensive areas of hemorrhagic extravasation.

Microscopically, there was a tumultuous cellular proliferation, made up of compactly arranged, globular cells of moderate size with meager, acidophilic protoplasm and relatively large globular nuclei with rich chromatin content. Mitotic figures were not uncommon. The delicate stroma was infiltrated with small rounded cellular elements of lymphoid aspect.

This was the twenty-sixth instance of seminoma in an intra-abdominal testicle which had undergone torsion on its pedicle to be reported.

The simple orchiepididymectomy was preferred to the more radical operation of Chevassu, because it is not so destructive and the ultimate results of the two methods are not too different.

—*John E. Brennan, M.D.*

MISCELLANEOUS

Use of the Artificial Kidney; Its Place in the Treatment of Acute Renal Failure. PETER F. SALISBURY. *California M.*, 1958, 89: 187.

THE "CONSERVATIVE" MANAGEMENT of patients with acute renal failure is now a matter of universal agreement. There is a wide divergence of opinion, however, regarding the more intensive modalities of treatment. The efficiency of the artificial kidney procedure is widely recognized and its use is routine in many centers; yet controversy about hemodialysis in individual cases obstructs the path toward standardized management of acute anuria. While some investigators do not publish their criteria for the use of dialysis, others use it only in patients with a blood urea nitrogen over 200 mgm. per cent.

This report concerns 57 patients with potentially reversible renal failure and no other associated fatal primary pathologic condition. Thirty-nine of the patients survived and 18 died. The patients were observed in a 4 year period ending early in 1958. Many cases were not managed completely by the author but those that were, had standard conservative measures. Particular attention was directed to water balance (fluid intake usually restricted to visible output plus 500 c.c. per 24 hours), to electrolyte balance, to administration of a high caloric protein free regimen, and to careful clinical and chemical supervision. Hemodialysis was performed with the portable Skeggs-Leonard's machine. Blood was withdrawn and administered via a double lumen catheter inserted into the inferior or superior vena cava by way of a saphenous or external jugular vein. Hemodialysis usually lasted about 4 hours and required 150 mgm. of heparin in the average patient.

Twenty patients recovered without dialysis. Anuria-oliguria (urine output less than 500 c.c. per day) continued for from 3 to 11 days, the highest blood urea nitrogen being 195 mgm. per 100 c.c., the highest serum potassium 9.2 mEq. per liter. Varying severe signs and symptoms of uremia were seen in individuals of this group. Peripheral edema was always associated with excessive fluid administration.

Nineteen recovered with the aid of the artificial kidney, and 16 of these were considered by all physicians concerned to have been saved by this procedure. Anuria-oliguria lasted from 8 to 39 days. Dialysis was used from the fifth day to the twenty-third day after the onset of anuria. In 4 cases, it was done twice. The highest blood urea nitrogen was 240 mgm. per cent, highest serum potassium 10.2 mEq. per liter. Apart from chemical indications, the clinical indications for dialysis were severe neurologic signs (coma, etc.) and coexisting neurologic and circulatory abnormalities (pulmonary edema). Previous overhydration, when found, was corrected. Severe electrolyte abnormality was the primary indication for dialysis in 8 cases and clinical signs of uremia in 11.

The effect of this procedure was attested by chemical determinations and by clinical changes. Abnormal blood electrolyte levels including the pH were corrected in every instance. Amounts of urea removed from the patient and recovered in the dialysis fluid varied from 38 to 180 grams. Blood urea nitrogen levels decreased significantly in all cases but this was not always reflected in the large amount of nitrogenous material recovered in the dialysis fluid. The average change of blood urea nitrogen was from 181 mgm. per cent before dialysis to 73 mgm. after dialysis.

The effect of the artificial kidney procedure on the clinical signs and symptoms in the surviving group of patients was striking. The improvement in the nervous and mental states was marked. In this group of patients, untoward incidents did not occur during dialysis.

In the 18 patients who died, autopsy findings revealed that the patients were suffering from potentially reversible renal lesions. Death occurred as early

as 4 days and as late as 21 days after the onset of virtual anuria. Three of the 6 "early" deaths could be attributable to overhydration resulting in pulmonary edema. In one case, unrecognized active rheumatic carditis co-existed with uremia. The other patients died in extreme uremia although one died in normal electrolyte balance.

The observation in this series should permit conclusions concerning the most effective use of the artificial kidney. The clinical and chemical course of acute renal failure in the group who died closely resembled the pattern observed in the recovered group, except for the correct use of dialysis. Although patients in the terminal stage of uremia often have been saved by the artificial kidney, it is now agreed that hemodialysis should be employed earlier. It is felt that not only does it prevent the development of irreversible complications, but also that the fatal progress of the disease is often too rapid to permit the start of intensive treatment when there has been excessive delay.

Following are the indications for the use of the artificial kidney:

1. Chemical indications:
   a. Serum potassium 7.0 mEq. per liter or more.
   b. Rapidly mounting serum potassium.
   c. Carbon dioxide 12 mEq. per liter or less.
   d. Blood urea nitrogen 150 mgm. per 100 c.c. or nonprotein nitrogen 200 mgm. per 100 c.c.
2. Existence of two or more of the early clinical signs of uremia (reflex hyperactivity, restlessness, confusion, drowsiness, loud pulmonic second sound, low diastolic pressure, expiratory wheezes).
3. If after dialysis the above indications recur, dialysis should be repeated in compliance with the above indications, even though diuresis may already have set in.

—*Edward J. Frishwasser, M.D.*

Experiences with Kolff Twin Coil Artificial Kidney. J. H. HOLMES, O. G. STONINGTON, P. VAN SCHOONHOVEN, T. W. RICHEY, and YASUHIKO TAKEDA. *J. Urol.*, Balt., 1958, 80: 102.

THE AUTHORS report 93 dialyses performed with the Kolff twin coil artificial kidney. Twenty-two were employed for renal failure due to chronic renal disease. Twenty-three were employed for acute renal failure, secondary either to surgery or trauma. Eight were used for acute renal failure due to toxins, and 9 for barbiturate poisonings. Some of the complications of dialysis were abnormal response by the patient to drugs administered during the dialysis, digitalis-potassium physiologic antagonism with the necessity for care in lowering the serum potassium concentration in the digitalized patient, hemorrhage in patients with a potential bleeding lesion such as peptic ulcer, and infection. Dialysis removes most antibiotics and when indicated, the antibiotic drugs should be started immediately after dialysis in large initial doses.

The principal indications for dialysis are:

1. Uremia, either acute or chronic. Dialysis should be performed at the appearance of clinical signs of uremia toxicity, hyperkalemia above 7 mEq./L. acidosis of carbon dioxide below 12 meg/L., and a nonprotein nitrogen above 200 mgm. It is important to carry out dialysis prior to convulsions, circulatory collapse, and coma.
2. Electrolyte and fluid imbalance, as seen in water intoxication, hypernatremia, and severe acidosis.
3. Edema, either pulmonary or cerebral.
4. Hyperpotassemia, if the potassium level rises above 7 mEq./L. or if the electrocardiogram indicates serious potassium toxicity (widening of the QRS complex or progressive prolongation of the PR interval).
5. Intoxication with diffusible toxins, such as barbiturates.

The authors state that the Kolff twin coil artificial kidney has given consistently good performances and hemodialysis has been life-saving in many cases, but at this time the procedure should be limited to centers with sufficient personnel and experience to handle the dialyses correctly.

—*David Rosenbloom, M.D.*

Postoperative Infection in Urology. ASHTON MILLER, W. A. GILLESPIE, K. B. LINTON, N. SLADE, and J. P. MITCHELL. *Lancet*, Lond., 1958, 2: 608.

URINARY INFECTION is the most common complication following operations on the prostate gland and the bladder. A 3 year study of this problem was carried out with the aims of investigating the origin and clinical effects of this complication and finding means of prevention.

The study involved observations on 161 patients, 41 of whom had retropubic prostatectomy and 120 of whom had transurethral operations on the prostate gland or the bladder. The preoperative urine specimens were normal. In the usual case antibacterial medication was not given preoperatively. There was no preoperative drainage. At operation a plastic or latex rubber catheter was placed in the urethra for 3 days. Open drainage was used with a sterile rubber tube connected to the catheter and draining into a pail. In a later phase of the study closed drainage was used.

Urine specimens for study were obtained under aseptic precautions. Further studies to determine the sources of infections involved obtaining specimens for culture from the anterior urethra, the urine being obtained with the cystoscope, from prostatic fragments, and the irrigating fluid.

A patient was considered to have an infection if the urine contained at least 3,000 bacteria per c.c. Before remedial measures were taken to minimize infection, 13 of 16 retropubic prostatectomies and 29 of 41 transurethral operations were followed by infection, an over-all incidence of 74 per cent. The bacteria found, in order of frequency, were coliform bacilli, Proteus, Staphylococcus albus (of doubtful clinical significance), Streptococcus faecalis, Staphylococcus aureus, and Pseudomonas pyocyanea. Clinically 55 per cent of the patients with infection had pyrexia in contrast to 6 per cent of the uninfected patients.

Infections usually clear up spontaneously when the operative site heals and antibacterial therapy is often unnecessary. In some instances, however, serious consequences may develop, such as pyelonephritis, endocarditis septicemia, or bacteremic shock in which there is a profound fall in blood pressure combined with a rise in temperature.

Disturbances of the operative site, such as withdrawal of the indwelling catheter, may discharge bac-

teria into the blood stream. In an investigation which entailed blood culture studies done immediately, 5, and 20 minutes after withdrawal of the catheter it was found that in 7 of 14 patients with urinary infection, the cultures were positive in 5 minutes. In 15 patients with sterile urine the cultures were negative.

Investigation of the sources of the infection involved many areas. Bacteria similar to those which caused infection were sometimes isolated from the anterior urethra before operation, but not from swabs taken from operating room personnel, towels, cystoscopes, sterilizing, and rinsing solutions. The organisms were found on ward equipment and furniture. Bacteria could ascend to the bladder via the drainage tube and indwelling catheter. Rising air bubbles might carry organisms with them.

To prevent infection, improvements in drainage and irrigation methods were instituted. A closed drainage system was set up before the patient left the operating room by aseptically connecting the indwelling catheter to the sterilized drainage apparatus with a 4 foot length of sterile rubber tubing. The authors describe and illustrate their method of closed drainage and closed irrigation. Since infection developed in some patients even when they were treated with this improved method, it was felt that bacteria must also enter the bladder in other ways and methods of sterilizing urethral instruments in the operating room were changed. The instruments in use had previously been immersed in 1/2000 mercuric oxycyanide solution for 15 minutes. It was determined that immersion for 30 minutes failed to sterilize metal strips contaminated with Staphylococcus aureus. Proteus and coliform bacilli survived for about 20 minutes. An aqueous mixture of chlorhexidine "hibitane" 1-5000 and 1-2000 mercuric oxycyanide was substituted after some experimentation. As an additional precaution patients with urinary infections were kept at the end of the operating list as far as possible.

Since the introduction of these changes there has been a gradual reduction in the infection rate. The incidence of postoperative infection has fallen from 74 per cent of the 57 patients who were treated by the old methods to 23 per cent of 30 patients who were treated with the improved techniques of preserving asepsis. The incidence of improvement was shared by both retropubic and transurethral operations.

—Allan K. Swersie, M.D.

Osteomyelitis as a Complication in Urology. C. Q. Henriques. *Brit. J. Surg.*, 1958, 46: 3.

The urinary tract has been considered as a possible source of infection in osteomyelitis, but its special relationship to lesions of the spine has not been fully appreciated. While localized inflammation of the pubic bones is a recognized complication of prostatic surgery, its occasional spread to involve the acetabula with serious consequences to one or both hip joints has received little comment. The complex venous network that invests the vertebral column communicates with the pelvic plexus at one end and the intracranial venous sinuses at the other. There are connections of this paravertebral venous plexus with the systemic veins, pelvic, lumbar, intercostal and vertebral, as well as the intracranial venous sinuses. This plexus forms rich anastomoses with the venous channels within the vertebral bodies.

Batson (1940) injected this venous system via the deep dorsal vein of the penis and provided that the intra-abdominal pressure was raised, was able to fill the system in its entirety. From the prostatic plexus, venules ramify throughout the pelvis and pass to its outer aspect supplying the hip joints. Batson postulates that this venous system forms sluggish lakes into which blood is forced during a rise in intra-abdominal or intrathoracic pressure as in coughing or sneezing. He suggests that the distribution of osseous metastases from prostatic carcinoma is explained by this venous pathway, and that septic foci in the pelvis might give rise to similarly situated septic emboli. These emboli give rise to osteitis pubis and to the rarer conditions of septic arthritis of the hip and osteomyelitis of one or more vertebral bodies.

A table of cases is presented indicating definite association between infection of the urinary tract and osteomyelitis. Of the 55 cases, all but 11 followed operation. The distribution of the vertebral lesions; lumbar 27, dorsal 17, and cervical 6, parallels previously cited figures which indicate the constant predilection, for the lumbar spine (54.6 per cent), then the dorsal spine (25.9 per cent), and lastly, the cervical spine (10.3 per cent). In addition to the spine, the hip joint was affected in 5 cases, the shoulder joint in 2, the sternoclavicular joint in 1, the sacroiliac joint in 1, and the tibia in one case.

The causative organisms were isolated by direct culture from the bone or joint in 13 cases and the blood culture was positive in 8 of 15 cases. A table is presented to show the organisms obtained from these two sources and the organisms found in the urine.

The author reports 6 cases of osteomyelitis, 5 following operation on the lower urinary tract, and one which occurred spontaneously in the presence of urinary infection. In all cases, the urine was heavily infected with two or more organisms. Four patients had osteomyelitis of the vertebrae, one of the right hip, and one of the right shoulder.

—Edward J. Frishwasser, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Notes on a Rare Case of Essential Osteolysis. FRANCISCO BRANCO and J. DA SILVA HORTA. *J. Bone Surg.*, 1958, 40-B: 519.

THE AUTHORS describe a case of essential osteolysis in a 13 year old boy. Originally, there was marked pyrexia and diffuse tender swelling of the right thigh. Following sulphonamide treatment, there was considerable improvement, but chronic edema of the thigh and knee followed, the edema disappearing to some extent with rest. There was persistent inguinal lymphadenitis. The course was one of progressive, increasing swelling and eleven months after the onset, there was a spontaneous fracture at the junction of the upper and middle thirds of the right femur. Roentgenograms at that time revealed marked rarefaction of the femur with a pathologic fracture. The condition was considered to be Ewing's sarcoma at that time. A course of roentgen therapy was given. Rarefaction of the femur continued. Successive roentgenograms revealed spreading of the osseous destruction downward to the knee joint and upward to the pelvis and sacrum.

Six years after the onset of the illness, the patient came under the care of the authors. At that time, he had no motion in the lower extremity and there was ankylosis of the knee. The hip joint was markedly flexible. Roentgenograms at that time revealed that the upper two-thirds of the right femur, together with the lower one-half of the right innominate bone and part of the sacrum, had completely disappeared. A skeletal survey showed no alteration of any other bone. Pyelography did not reveal any abnormality of the renal tract. Later roentgenograms revealed continuous osseous destruction.

The laboratory tests yielded the following results: serum calcium, 10.4 mgm. per cent; serum phosphorus, 3.1 mgm. per cent; alkaline phosphatase, 4.2 Bodansky units. Sulkowitch's test, the Wassermann reaction, the blood sugar, and the blood urea were all within normal limits.

Histologic examination demonstrated that the remaining bone contained haversian canals which were widened and filled with fatty marrow. The lamellae were for the most part regularly arranged, but there were cement lines that were sometimes numerous and oriented in different directions, resulting in irregular mosaic figures. In the new bone, osteocytes were numerous. There was also osteoid substance at the edge of the bone, but only in small quantity. The general impression from the histologic studies was one of marked destruction in excess of the reparative activity. There was definite replacement of bone substance by an unusual connective tissue. This tissue was a basophilic substance containing connective fibers.

Sections from the skeletal muscle presented a variable degree of atrophy with some loss of striation, with occasional transformation into intensely eosinophilic hyaline masses.

Nerve tissue was deeply infiltrated by a basophilic metachromatic (toluidine blue) substance. There were defects in the axon segments. Myelin sheaths were relatively intact.

A review of the literature indicates 25 cases of this obscure disease in children or young adults. The sites of origin included the clavicle, sternum, ribs, humerus, radius, ulna, small bones of wrist, metacarpal bones, fingers, maxilla, mandible, bones of the foot, femur, and pelvis. —*J. Robert Close, M.D.*

Massive Osteolysis (Disappearing Bones). G. BLUNDELL JONES and R. L. MIDGLEY. *J. Bone Surg.*, 1958, 40-B: 494.

THE AUTHORS report a case in which there was complete disappearance of the left scapula, the outer third of the clavicle, and partial absorption of several ribs. Death finally occurred from chylothorax due to obstruction of the thoracic duct by fibrous tissue.

Twenty-six such cases have been recorded previously. The osteolysis progresses until the affected bones are replaced by fibrous tissue. This condition is most common among adolescents and young adults. The bone resorption is gradual. Constitutional disturbance is slight and there have been no significant changes in the results of hematologic tests. There is no known effective treatment.

The case reported was that of a man, age 23 when the condition was discovered. There was marked wasting of the muscles of the left shoulder girdle. When he was admitted to the hospital there was a marked chylous effusion in the left side of the chest and he had marked dyspnea. During his stay in the hospital a total of 52.2 liters of fluid, equivalent to about 116 lb., was removed in 40 days. Numerous histologic specimens are illustrated in the article. The possibility of an eosinophilic granuloma must be considered and also the fact that osteolysis seems to be related to the hemangiomatous condition.

—*Richard J. Bennett, Jr., M.D.*

Disappearing Bones. S. M. MILNER and S. L. BAKER. *J. Bone Surg.*, 1958, 40-B: 502.

THE PATIENT was an elderly woman, 58 years of age when first seen, and in whom the bones of the left upper arm had been progressively disappearing. She complained only of stiffness in her left shoulder. Roentgenograms of the left shoulder revealed changes in the humerus, ribs, clavicle, and scapula. There was a nodule about one-half inch in diameter in the right lobe of the thyroid gland which was subsequently removed and diagnosed as an adenoma. At the age of 63 she was not able to use the arm, and at age 65 the upper end of the humerus had disappeared entirely. The entire arm was flail above the elbow.

There are eight illustrations of histologic specimens. The case report does not suggest the etiology or the treatment. —*Richard J. Bennett, Jr., M.D.*

Osteoporosis of Unknown Cause in Younger People. W. P. U. Jackson. *J. Bone Surg.*, 1958, 40-B: 420.

Generalized osteoporosis, osteomalacia, and osteitis fibrosa must be considered in the differential diagnosis. From the clinical standpoint pain is usually the outstanding feature. The radiologic features are not diagnostic.

The biochemical findings are not of value in making a diagnosis. The possible existence of associated liver disease, epilepsy, diabetes, dysthyroidism, malabsorption, and malnutrition was considered.

Histologic investigation of the bone was carried out in the present series of 38 cases. Illustrative cases are presented.

The disease in women is usually associated with late pregnancy or the period of lactation. In this series there was an apparent relation to pregnancy or lactation in 7 of the 11 women. The course of the disease in women has been variable. The incidence of idiopathic osteoporosis has been greater in men than in women, that is, 27 to 11. The average age of onset in women is much lower than in men, 27 years as against 41 years. The differential diagnosis is extremely difficult. The cause of the condition is unknown.

The treatment recommended consists of orthopedic appliances when necessary; dietary supplements of calcium, vitamins, and proteins are of doubtful value. Despite this, the author recommends 150 gm. of protein a day and large doses of vitamin D. In the acute phase the intravenous administration of serum albumin or plasma may be tried. The treatment of this condition has been found unsatisfactory.

—*Richard J. Bennett, M.D.*

Sudeck's Syndrome in Children (Das Sudeck-Syndrome in Kindesalter). E. Sieber. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 288: 423.

Although Sudek's syndrome occurs mostly in adults, it has also been reported in children. In differentiation from regular postimmobilization atrophy after trauma, the Sudeck's syndrome occurs in two stages. In the first stage there is pain, increased skin temperature, swelling, muscular atrophy, limitation of joint motion, hyperhydrosis, and diffuse osseous decalcification is found on the roentgenograms.

In the second stage the changes are more pronounced. The skin appears atrophic and smooth to the touch. There is also disturbance of nail growth and pain when pressure is applied to the skin.

Between 1953 and 1958, 648 children from 1 to 12 years of age who had fractures were examined for signs of Sudeck's dystrophy. Fifty-eight children had roentgenologic changes compatible with Sudeck's dystrophy. The metaphysial and epiphysial regions of the long bones showed diffusely distributed rarefaction. The majority of the children had inflammationlike changes involving the skin, which occurred 2 to 3 weeks after the trauma and disappeared in 6 weeks. These changes were mild in younger children, but were more pronounced after the age of 10. Histologic examination of the involved bone in one case showed diffuse vascular dilatation, the presence of increased bone absorption, and increased fibrosis. The absorption of bone was especially noted close to the vascular channels.

Three case histories are described in detail. Two 4 year old children had stage I Sudeck's dystrophy of the lower extremities; the condition was transient and disappeared spontaneously. In one 12 year old child, however, the symptoms were more severe and required prolonged treatment. Roentgenograms of all 3 patients revealed diffuse decalcification of long bones.

From this study the author concludes that Sudeck's dystrophy does occur in childhood. In children less than 10 years of age it occurs in a mild form, but in older children it may go into the second stage. The prognosis, however, is very favorable. The author suggests that changes in the vegetative nervous system and hormonal system in childhood after the age of 10 may be responsible for the difference in the severity of dystrophic changes. —*George Wichman, M.D.*

True and False Bone Cyst Formation in Adults on a Degenerative Basis (Echte und falsche Knochencystenbildung bei Erwachsenen auf degenerativer Grundlage). Hans Hellner. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 288: 267.

True bone cysts are those which are filled with fluid and have an epithelial or endothelial lining. Pseudocysts are usually filled with connective tissue and do not have an epithelial lining. Often, differentiation between these two types of cysts is difficult on the roentgenogram. There are five types of true and false bone cysts which occur in adults and cannot be classified either under the heading of juvenile bone cysts or cystic degeneration within a giant cell tumor.

The first of these is a cyst which arises from bony degeneration in response to repetitive excessive stress applied to the bone. These cysts can be imitated experimentally. They are often seen in the carpal bones of men who use a compressed air hammer in their work. The treatment of cysts of this type is conservative. The causative agent must be removed.

The second type of cyst is a degeneration cyst which occurs in the region of joints that are affected with arthrosis deformans, most often in the region of the hip joint. These cysts usually occur under the joint cartilage. They are often encountered incidentally in routine roentgenographic examinations for other purposes. They contain no fluid, but only bony fragments, connective tissue, or fibrocartilage.

The treatment of these degenerative cysts will often be arthrodesis, if other indications for the arthrodesis exist. Usually, a rather marked amount of destruction of the bone will be present before arthrodesis is undertaken. Merely the existence of such a cyst on the roentgenogram is not a sufficient indication for operation. One must also consider the amount of pain which the patient has and the functional demands which are placed upon the individual joint concerned.

The third type of cyst occurs as an area of destruction in the form of a pseudocyst following a previous fracture. Such areas may be noted in a donor bone following the removal of a large bone graft. They are also frequently seen after intramedullary nailing of fractures. If the function of the neighboring joints remains good and the weight bearing ability of the bone is not endangered, improvement will frequently be noted if the affected part is put at rest.

The fourth type of cyst is one which has probably not been well recognized up to the present time. These cysts appear to occur as the result of a neighboring inflammation, often the inflammation of a chronic bursitis. Cystic degeneration of the bone beneath the inflamed region then develops. Symmetrical and bilateral occurrence of these cysts may indicate that at times there is a constitutional factor involved in their development. These cysts should be treated by removal of the cyst; the cavity is packed with cancellous bone.

The fifth group includes cysts that are frequently filled with fluid and have a wall of connective tissue, whose origin cannot be explained on any other basis than that of developmental failure. These cysts are commonly seen in the lower tibial region and are often bilateral. These cysts could not be attributed to repeated trauma to the bone. There was no arthrosis deformans in the neighboring joints. The treatment of these cysts has been surgical removal of the cyst, together with its lining; the remaining cavity in the bone is packed with cancellous bone.

—Robert D. Larsen, M.D.

Albers-Schönberg Disease (Die Albers-Schönbergsche Krankheit). J. FAZAKAS and E. GHERMAN. *Zschr. Orthop.*, 1958, 90: 260.

AT A MEETING in Hamburg in February, 1904, Albers-Schönberg presented the case of a man, age 26, who suffered from a subtrochanteric fracture of the femur following a very slight trauma and also had a generalized thickening of the skeleton. Since that time, many cases of Albers-Schönberg disease were described.

The author was able to observe a patient with Albers-Schönberg disease for about 7.5 years. A female, age 14.5 years, was admitted to the hospital because of a fracture of the right trochanter following a fall. The patient reported on admission that she had had previous fractures which had healed without specific treatment within 3 to 4 weeks after the injury. The skin appeared to be thickened and presented changes in pigmentation. Biopsy of the skin revealed atrophy of its over-lying portion and sclerosis of its deeper areas. The roentgenogram of the pelvis revealed coxa vara of both hips and the cortex was greatly increased in size. The base of the skull was thickened. (The calvarium also revealed a thickened outer cortex. There were bilateral deformities of the tibiae.) Biopsy of the bone revealed thickening, and even the cancellous bone showed a tendency toward sclerosis. The laboratory findings revealed mild eosinophilia and an increase of the serum calcium. The examination also revealed an enlargement of the liver and spleen, and thickening of the skin which looked like that of an old woman.

About 7.5 years after the onset of the condition, the patient was re-examined and revealed considerable enlargement of the mandible. There were many sinuses on the lower portion of the mandible with granulation tissue growing out of them and there was some purulent discharge. The laboratory findings revealed an anemia and there was a mild leucocytosis.

In the differential diagnosis of this condition osteopetrosis, lymphatic and myositic leukemia, and lymphogranulomatosis were considered. Engleman's disease, lead, strontium, fluoride, and bismuth and phosphorus, as well as other heavy metal, poisoning were also considered. Osteopoikilosis, melorheostosis, metastases, and localized osteomyelitis were also considered. Albers-Schönberg disease is congenital and occasionally appears even during intrauterine life. It appears that, in the main, it affects the connective tissue, causing secondary changes in the skin and bone.

The author believes that cases of localized bone condensation, osteopoikilosis, melorheostosis, and of the more advanced "full-blown" Albers-Schönberg disease constitute the same condition in different stages. It appears that in cases in which osteitis of the mandible was found, small areas of necrosis developed within the bone. Small sequestra were eliminated through the sinuses that formed the lower portion of the mandible. No known treatment was found for this condition.

—George I. Reiss, M.D.

Pott's Disease. R. G. WILLIAMS, JR. *Canad. M. Ass. J.*, 1958, 79: 246.

THE AUTHOR has made a study of the effect of antimicrobials in tuberculosis, particularly regarding Pott's disease. The data are from the Baker Memorial Sanitorium in Calgary.

As a rule, Pott's disease is slow in developing and is characterized by pain, spinal deformity, abscess formation, and sometimes paralysis. In Scotland, the extremely high incidence of bovine tuberculosis accounted for the high incidence of Pott's disease in children. In the present study, the greatest incidence was in the third decade of life.

The route of spread varies. It may spread from the primary lesion in the lung to hilar nodes directly to vertebral bodies (Fraser). It may reach the vertebral bodies by lymphogenous spread either to the thoracic duct or to the veins of the involved node. The bacteria may be embolic in the blood stream. When resistance is low, miliary disease results. Infarction results in multiplication. Such avascular necrosis may be masked by decalcification. In the end, the result is typical decalcification without sclerosis.

The common vertebral site in children is near the epiphysial plate. From here, it may spread to involve the adjacent bone and disc. In adults, the earliest sign of a focus may be in the disc. From either of such foci, the infection may spread anteriorly or posteriorly. The latter can result in paraplegia.

Sixty cases are reported. Eighteen patients were more than 30 years of age. There were 36 males and 24 females. The usual location was lower dorsal or upper lumbar. There was no case of a cervical lesion. Five patients had a double spinal lesion and one had a triple lesion.

In 24 cases the disease was associated with pulmonary tuberculosis, 7 cases were associated with genitourinary tuberculosis, 3 with cervical lymph nodes, 27 with Pott's abscess, 8 with other bone lesions, and 4 cases with abdominal lesions. There was one case of paraplegia.

The history is helpful in making a diagnosis. There are often weight loss and loss of strength and frequently night cries in children. A familial history of tuberculosis or of drinking raw milk is frequent.

Fusion was not always used in the treatment of the condition. One patient with a known inactive lesion (fused) had a psoas abscess which was explored and drained. Paraplegia after adequate spinal fusion has been reported to have taken place elsewhere. The one case of paraplegia was treated with costotransversectomy with almost complete recovery.

Posterior fusions were used. Medical treatment alone was used in 8 active cases. Surgical intervention of some type was necessary in 30 cases. The author arrived at the following principles of treatment: (1) adequate medical management with antimicrobial drugs and absolute bed rest on a Stryker frame usually for 6 months; (2) if this produced complete healing of the lesion, fusion was not done, but drugs were continued for a year; and (3) fusions included the site of the lesion and two vertebrae above and below

—J. Robert Close, M.D.

Differential Diagnosis of Injuries to the Knee Joint Resulting from Sports (Differentialdiagnostik der Knieverletzungen und Knieschäden in der sportlichen Ambulanz). R. SUCKERT. Sportäerst. Praxis, 1958, p. 39.

THE AUTHOR discusses the differential diagnosis of knee injuries encountered in sport. In simple contusion there is no pain present on lateral-medial motion of the knee joint or over the collateral ligaments. In distortion usually the effusion of the knee joint is present, as is tenderness over the collateral ligaments, especially when the leg is brought into adduction or abduction. The collateral ligaments can be torn by direct and indirect trauma. The inner ligament is frequently injured when a fixed knee is forced into valgus. After the injury the knee joint is held in flexion, since in this position the inner ligament is relaxed. This position makes tear of the inner ligament very difficult to differentiate from an acute tear of the meniscus medialis. However, under general anesthesia the knee can be brought into complete extension whereas, when the meniscus is torn, complete extension is impossible. In injuries of the cruciate ligaments a draw sign is usually present and is easy to recognize.

A rotational trauma to the knee joint frequently causes a tear of the meniscus medialis. In acute cases it is very difficult to recognize, since in many instances the damage of the soft tissue which occurs at the same time, confuses the picture. In differential diagnosis in chronic cases, chondromalacia of the patella, loose cartilaginous bodies, and Hoffa's disease should be considered. The tears of the quadriceps tendon and patellar fractures are easily differentiated by clinical examination and roentgenograms. *—George B. Wichman, M.D.*

Neurotrophic Ulcers of the Feet. P. J. KELLY and M. B. COVENTRY. *J. Am. M. Ass.*, 1958, 168: 388.

NEUROTROPHIC ULCERS are the result of damage to sensation, peripheral or central in origin. This condition is seen most frequently in diabetes because of a peripheral neuropathy. Other conditions in which neurotrophic ulcers are seen are myelodysplasia, syringomyelia, posttraumatic lesions of the cord, tabes dorsalis, and injuries of the sciatic nerve. The most common location in 47 patients with ulcers due to neurotrophic causes was over the plantar aspect of the metatarsal head. The medial aspect of the great toe and the lateral aspect of the fifth metatarsal head, as well as the tips of the toes, were frequent areas for ulcers. The feet were generally broad with hammer toes, hallux valgus, and prominent metatarsal heads. The ulcer was punched out and circular and was associated with infection. Sensory alteration following dermatome patterns denotes radicular lesions, myelodysplasia, and old injuries of the cord. This is not found in diabetic neuropathy. The finding of bony proliferation, periosteal thickenings, sclerosis, or destruction on the roentgenogram may be indicative of neuropathic changes. Frequently the combination of neuropathy and infection is seen.

Treatment in diabetic neuropathy consists of control of the metabolic problem. Good foot wear, with proper padding and bars, is essential. Surgical treatment for ulcers under metatarsal heads consisted frequently of the removal of the toe, and the metatarsal head. The operation was performed as a two-stage procedure with healing allowed by second intention, rather than by secondary closure. Below the knee amputations were performed less frequently, and then only for difficult problems with recurring multiple ulcers of long chronicity. The authors suggest that elderly diabetics should be observed for problems and perhaps routine roentgenograms of the feet should be taken.

Early treatment consisting of débridement of the ulcer, trimming of callus, restriction of activity, and the wearing of adequately padded shoes may be sufficient to heal the ulcer and prevent further difficulty.

—Alvin J. Harris, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Acroparesthesia and the Carpal Tunnel. T. B. S. DICK and F. R. ZADIK. *Brit. M. J.*, 1958, 2: 288.

THE AUTHORS describe the results of division of the transverse carpal ligament in 30 consecutive patients suffering from acroparesthesia (numbness, tingling, and stiffness of the extremities, particularly in the fingers). In 1893, Schultze first used the term to describe nocturnal attacks in the hands of middle-aged women. In the present series, the great majority of the patients described the pain and paraesthesia as nocturnal. McArdle (1951) was the first to suggest that compression of the median nerve in the carpal tunnel by the carpal ligament was the cause of the condition.

Of the 30 patients, 6 were male and 24 were female. Four cases were bilateral. Following division of the carpal ligament, there was immediate relief of the pain and paresthesia in 33 patients. Wasting, present in 4 patients, took many months to be relieved. Sensory impairment, in 13 patients, was not severe and the patients tended to recover quickly.

In 14 cases, pain was referred to the arm above the wrist. In one case, it was referred as high up as the shoulder. A useful test consists of firm pressure over the transverse carpal ligament for one to three minutes; this reproduces the typical paresthesia in many cases. *—J. R. Close, M.D.*

Diaphysoepiphysial Resection for Bone Tumor at the Knee. R. Merle D'Aubigné and J. P. Dejouany. *J. Bone Surg.*, 1958, 40-B: 385.

Nine cases of extensive resection of bone tumors at the knee are presented. The indications for resection are primarily giant-cell tumors, certain malignant tumors, and osteogenic sarcoma.

It is necessary to restore continuity after resection. Apparently the only safe procedures are those that bridge the gap with an autogenous graft strong enough to allow weight bearing.

Ten illustrations of roentgenograms are included to show the details of the resections and postoperative results. A table of the results is presented, showing the age, diagnosis, type of operation, early result, and late result in the 9 cases.

With regard to early results, of the 4 patients in whom a tibial or femoral autograft, a nail, and an acrylic prosthesis were used there was one death and bony union resulted in the 3 others. In 5 patients who had a nail, a tibial or femoral autograft, a massive homogenous graft, and the patella fixed to the autograft there was one case of infection with fracture of the graft, necessitating amputation. There were 4 cases of bony union with weight bearing before 3 months.

Taking into consideration the late results there were 4 cases of sarcoma with one early death, one with multiple metastases at 8 months, one with recurrence at 2 years, treated by amputation. One patient is symptom free after one year. Of 5 patients in whom the diagnosis was giant cell tumor, there was one recurrence with amputation and pulmonary metastasis.

The details of the operative technique are given along with three illustrations. Briefly, after resection of the upper end of the tibia or lower end of the femur, a portion of the anterior half of the remaining bone is removed and transferred to the area of the defect. A long Küntscher nail must be available. This nail is hammered into the femoral medullary cavity from the lower end upwards, brought out through the buttock, and then hammered down through the medullary canal of the homograft and the tibia. The massive tibial graft is fixed upside down by screws to the lower end of the femoral shaft, to the graft, and to the upper end of the tibia. The posterior surface of the patella is then freshened and screwed to the front end of the tibial autograft.

—*Richard J. Bennett, M.D.*

Treatment of Congenital Absence of the Tibia and End Results (Le traitement de l'absence congénitale du tibia et ses résultats éloignés). C. R. Michel and M. Guilleminet. *Rev. chir. orthop.*, Par., 1958, 44: 125.

Ten case histories of children treated for congenital absence of the tibia were studied. In 6 patients the deformity was bilateral. Among these cases there were 4 complete absences, 4 partial absences, and 2 congenital atrophies of the tibia.

Since the deformity, if not treated, seems to result in a useless extremity, treatment should be instituted. It should be started early and aim at three points: the weight-bearing value of the foot must be restored, the shortening of the limb should be compensated, and the growth potentiality of the limb should be preserved.

To restore bony continuity of the limb, the use of the fibula is always to be preferred to the use of free grafts. When the tibia is completely absent at the knee joint, one has the choice between an arthrodesis, a nearthrosis, and a bifurcation operation of the head of the fibula. The authors seem to favor the first operation.

In cases with a partial absence of the tibia a synostosis between the fibula and the proximal tibial fragment is the procedure of choice. Different techniques may be used.

To restore the weight-bearing value of the foot, an ankle arthrodesis with the foot at a right angle or in equinus position (Putti) must be performed.

To complete the surgical treatment, prostheses are very important. These may vary from an orthopedic shoe with elevated heel to a long leg brace.

From this study the authors conclude that treatment should be started about the fifteenth month of age. They prefer to start with arthrodesis of the ankle joint (from 14 months on), followed by arthrodesis of the knee joint after the child reaches the age of 4 years. Amputation should be carried out in severe cases seen at the end of the growth period

—*J. C. Mulier, M. D.*

FRACTURES AND DISLOCATIONS

Two Cases of Recurrent Dislocation of the Shoulder Treated by a Newly Created Glenohumeral Ligament (Deux cas de luxation récidivante de l'épaule traités par la confection d'un ligament glénohuméral artificiel). J. Delchef. *Acta orthop. belg.*, 1958, 24: 98.

A new surgical technique is described for the treatment of recurrent dislocation of the shoulder. A small strip of skin, excised at the site of the incision, is used to construct a new ligament between the head of the humerus and the center of the glenoid cavity. A posterior approach to the shoulder was used.

In the 2 patients on whom this operation was performed the result remained satisfactory after 15 and 17 months, respectively, although glenohumeral movement was slightly restricted in the second case by nonunion of the osteotomized spine of the scapula and laceration of the infraspinatus muscle.

To obviate the difficulties of the posterior approach, the author performed the same procedure on the cadaver through an extended anterior approach, and found it easier, especially when using an angulated perforator to perforate the neck of the scapula.

—*J. C. Mulier, M.D.*

Complicated Fractures of Monteggia at the Elbow Joint (Fractures complexes de Monteggia). A. Trillat. *Acta orthop. belg.*, 1958, 24: 114.

Four cases are presented, 2 patients with a recent complicated Monteggia fracture (one with a fracture of the radial head) and 2 children with unrecognized luxations of the radius complicating fractures of the proximal ulna.

The following procedures were recommended for the first 2 cases:

1. A stable reduction of the ulnar fracture must be obtained. Intramedullary fixation is the most useful technique.

2. If the coronoid process is displaced it may be fixed with a suture of nylon.

3. A stable reduction of the dislocated radial head, which is possible only when the alignment of the ulnar fragments is restored.

4. In case of a fracture of the radial head, an attempt should always be made to save it.

In children with unrecognized and untreated dislocations of the radial head, fracture of the ulna with slight displacement is present. Although there is little functional disability it is the author's opinion that surgical treatment is advisable, especially because of the danger of late degenerative arthritis. After open reduction, the head of the radius must be fixed with fascia, tendon, or strips of skin grafts to prevent recurrence of the dislocation. —*J. C. Mulier, M.D.*

Problems in Shovel Injuries (Beitrag zum Problem der Schipperfraktur). G. SCHRÖDER. *Zbl. Chir.*, 1958, 83: 1495.

SHOVEL INJURIES usually consist of tear fractures involving the distal cervical and proximal dorsal spinous processes. They are caused either by direct muscle pull or by minimal trauma leading to fatigue fractures. The seventh cervical vertebra represents topographically a section of diminished resistance. The fracture occurs in the distal portion with downward displacement of this fragment. Occasionally similar changes are found in younger people with osteochondritic disease. —*E. H. Bettmann, M.D.*

Uncomplicated Subastragalar Dislocation (Contributo allo studio della lussazione sottoastragalica non complicata). P. PAGANO and G. SCLAUSERO. *Arch. chir. ortop. med.*, 1958, 23: 63.

THE AUTHORS report on a 40 year old male patient who sustained a medial dislocation of the subastragalar joint following an accident while riding a bicycle. There was no fracture present. The dislocation was reduced under general anesthesia and then immobilized for 30 days. He was allowed to return to work 70 days after the accident.

After 8 months the patient was found to have only a slight tenderness on the lateral aspect of the subastragalar joint. The roentgenogram was within normal limits. The patient was considered to have a 5 per cent permanent disability. This was below the minimal fixed damage for this kind of injury, 8 per cent having been set by Delae and 10 per cent by Patrik. —*Lucian J. Fronduti, M.D.*

ORTHOPEDICS IN GENERAL

Posttraumatic Osteoporosis and Sudeck's Disease (Posttraumatische Osteoporose und Sudecksche Krankheit). R. FONTAINE. *Wien. med. Wschr.*, 1958, 108: 679.

POSTTRAUMATIC OSTEOPOROSIS and Sudeck's atrophy are identical conditions. They represent the entity of an active disease and are very different from an atrophy due to inactivity.

Clinically, 3 stages can be described and roentgenologically proved. An ascending anabolic phase is followed by a catabolic phase with a spontaneous healing tendency. Only in very few cases do all symptoms of the disease disappear. In most cases, pronounced residual symptoms remain. These symptoms are not restricted to bone alone. Neurovegetative disturbances are the rule. They may even predominate with osteoporosis in the background. Other disturbances are traumatic edema, physiopathic anomalies, and causalgia.

One also finds osteoporosis in all the cases called neurovegetative posttraumatic dystrophy or posttraumatic reflex syndrome.

Primary vasomotor disturbances lead to faulty exchange of gas in the tissues with consecutive decalcification. Minerals so mobilized settle in neighboring soft tissue. They result in pain, contractures, and stiff joints.

In the beginning, porotic bone appears hyperemic and is later poorly vascularized with yellow fatty infiltration. At this stage the porosis becomes irreversible and may in some cases turn into incurable progressing osteolysis.

The etiology of Sudeck's atrophy depends on the nature of the trauma, and the topography of the injured parts, with concurrence of the endocrine and psychic factors. Since errors in the treatment of fractures may lead to such complications, it should be stated that correct and gentle treatment of fractures is the best prophylaxis against Sudeck's atrophy.

Osteoporosis may be helped by active hyperemia, by physiotherapy, or by pharmacological means. Local injection of procaine may be used. Ganglionic blocking agents or surgery of the sympathetic system may become a necessity. —*Otto Weiss, M.D.*

So-Called Spontaneous Cervical Dislocations. TORMOD HAUGE. *Acta chir. scand.*, 1958, Supp. 232.

FIVE CASES of patients with so-called spontaneous cervical dislocation are reviewed. All the patients were operated upon and there were two postmortem examinations. The first case was a 5 year old male, who, at the age of 3, fell down a flight of stairs, and for some weeks suffered from a stiff neck. Some time later cervical adenitis, fever, and a stiff neck developed. He responded to treatment with penicillin but the stiffness in the neck persisted and roentgenograms revealed a forward dislocation of the atlas. A separated odontoid process dislocated forward on the body of the axis was observed on the tomogram. A diagnosis of apophysiolysis was made and skull traction applied. The traction had no effect on the dislocation and an operation was performed. Repositioning of the odontoid process was accomplished with a wire around the arch of the atlas and the spinal process of the axis. Recovery was excellent, however, the clear line between the odontoid process and the axis was still visible on the tomogram. Separation of the odontoid process may be due to trauma which results in fracture or apophysiolysis, or it may be due to a congenital malformation resulting in congenital absence or an anomalous union of the odontoid process with the axis.

In the second case, that of an 18 year old man, there was a history of rheumatic fever with pain in several oints at the age of 6. At that time stiffness of the neck with pain and twisting of the head toward the left shoulder occurred. These attacks recurred and gradually the symptoms became permanent. Severe symp-

toms of pain radiating down the shoulders, forearms, and hands existed. Every movement of the neck was painful. The patient had received many types of treatment before tomography revealed a dislocation in the atlantoaxial joint. Backward motion of the head caused intense pain and tenderness existed over the upper spinal processes. The clinical diagnosis was a chronic atlantoaxial dislocation due to congenital anomaly. An operation was performed, and the posterior arch of the atlas was found to be poorly developed and attached to the occipital bone by fibrous tissue. It was removed along with part of the occipital bone. Repositioning was impossible. Fixation was achieved by wires drilled through the remaining occipital bone and the arch of the atlas to the spinal process of the axis. Fusion by tibial grafts was attempted. The patient's condition deteriorated despite re-operation, and he died. The postmortem examination revealed air embolus and dislocation of the axis into the foramen magnum. Histologically, granulation tissue was found in the body of the axis, in the odontoid process, and in the arch of the atlas. The diagnosis was rheumatic arthritis with destruction of the first and second cervical vertebrae. The author believes a reasonable pathogenesis to be acute rheumatism at age 6, causing distention subluxation of the atlantoaxial joints. At age 18, the nearly complete destruction of these joints was due to specific rheumatic inflammation.

The third case was that of a 64 year old male, who had complained of polyarthritis when he was about 30 years old. He was confined to bed for approximately 8 years because of pain, swelling, stiffness, and deformity. The patient had a creaking sensation at the back of the neck. He was extremely deformed and mobility was almost impossible. There was considerable muscle atrophy and fasciculations were present in the right arm. There was loss of sensibility and a perspiration border corresponding to the fourth and fifth thoracic level. Electromyographic examination indicated a high cervical disease. At operation, the posterior arch of the atlas was found to be assimilated to the occipital bone by fibrous tissue. The diagnosis was atlantoaxial dislocation with myelopathy and congenital anomaly. Part of the occipital bone and the posterior arch of the atlas were removed plus a fibrous ring around the dura in the foramen magnum. A ventrolateral chordotomy was performed at the level of C4 and C5. The patient died on the second postoperative day. Histologic examination revealed chronic, inflammatory changes in the periarticular connective tissue around the odontoid process, with perforation of the corticalis. Neuroanatomical examination revealed bilateral atrophy of the pyramidal and spinocerebral tracts, atrophy of the anterior horn cells of the thoracic region, and signs of cerebellar atrophy.

The fourth patient, a 55 year old female, also had a history of chronic polyarthritis. She had been unable to walk unaided for approximately 20 years. Four years prior to hospitalization, she complained of pain in the neck radiating to both arms. Roentgenograms revealed a severe kyphoscoliosis with subluxations. Clinical examination revealed deforming polyarthritis and loss of sensibility distal to the C4 segment. The patient displayed bulbar symptoms with distinct dysarthria. Roentgenograms revealed forward dislocation of the fifth vertebra on the sixth, and a marked scoliosis. The patient had visual disturbances and hallucinations. Surgery was performed and a distinct forward dislocation of C5 on C6, as well as a moderate dislocation of C6 on C7 was demonstrated. The bony substance had decayed and was useless as an attachment for wires, except at the sixth and seventh cervical vertebrae. Tibial transplants were grafted onto the seventh to the second cervical vertebra, to secure the reposition. Postoperatively, the patient was benefited, and the bulbar symptoms disappeared as did the visual hallucinations. The loss of sensibility was reduced to hemihypesthesia distal to the left breast.

The fifth case is that of a 39 year old male who had been blind since birth and was admitted to the hospital for pain in the back and Bechterew's disease in 1946. The back and neck became progressively and completely stiff. In 1955 the patient had a tingling sensation in both arms, especially the left, and the weakness had increased until he was unable to lift his arm to his mouth. His legs also became involved, and he was practically quadriplegic. The cervical spine was almost at a right angle to the thoracic spine and the chin was resting on the chest. Hypesthesia existed distal to C5. Roentgenograms revealed forward dislocation of C4 on C5 and the whole spine showed the changes of Bechterew's disease. At operation nearly complete atrophy of the neck muscles was found with fatty infiltration. The interspace between the arches of the vertebrae was filled with granulomatous tissue. A destructive arthritis was observed where no cartilage was preserved. All joints visible were ankylosed and no capsular ligaments remained. The dislocation was repositioned with wires through the fourth and fifth cervical vertebrae. Tibial grafts were implanted on the whole cervical column. The postoperative course was uneventful but no improvement of the paralysis occurred.

By means of these 5 cases the author has shown that spontaneous cervical dislocation should be regarded as a potentially progressive disease which may lead to neurologic symptoms. After a course of conservative measures, open reduction and bony fusion should be attempted. The possibility of anomalous conditions should be borne in mind.

—Alvin J. Harris, M.D.

The Marfan Syndrome (Sulla sindrome di Marfan). P. D. Barigazzi. *Arch. chir. ortop. med.*, 1958, 23: 63.

The author reports 4 cases of the Marfan syndrome encountered at the Pio Institute in Santa Corona, Milan. A brief summary of each case is presented. The diagnosis is considered to be easy as the individuals present a characteristic habitus, the limbs are long and slender, the muscles hypotonic and hypotrophic with little panniculus adiposis. Thoracic and vertebral alterations are seldom absent (pigeon breast, cobbler's sternum, kyphosis, and kyphoscoliosis). Cardiac, ocular, and the more rare skeletal deformities may be absent without making the diagnosis uncertain.

There are many theories as to the cause of this condition, including endocrine dysfunction, exaggerated distal osteogenesis, and mesodermic dystro-

phy. Most authors believe that it is due to an alteration of the germinative plasma in the organs of mesenchymal origin.

The authors stress an early diagnosis, which can be made during infancy when adequate prophylactic measures can be taken to prevent the thoracic and vertebral deformities. These cannot be successfully treated after they have developed.

—*Lucian J. Fronduti, M.D.*

Arteriographic Studies of Vascular Conditions During Healing of Lower Leg Fractures (Die Durchblutung von frakturierten Unterschenkeln waehrend der Heilung an Hand von arteriographischen Untersuchungen). F. BAUMGARTL, H. GREMMEL, and K. H. WILLMANN. *Zbl. Chir.*, 1958, 83: 1386.

DURING THE HEALING of tibial fractures there are considerable vascular changes according to Leriche. Vascular spasms occur usually immediately after trauma. In rare exceptions, however, they may not occur until some time has elapsed.

This phase of vascular constriction usually terminates after several hours. While the fracture hematoma is developing, considerable hyperemia occurs above the fracture site. The hyperemia is so strong that vasodilatory drugs cannot duplicate this natural phenomenon. Half of the cases tested showed hyperemia below the fracture site, whereas in the other half diminished circulation was evident. After the fracture hematomas receded, the vascular conditions were unchanged. There was evidence that the circulation time was increased until the plaster of Paris casts were removed. The acceleration returned to normal several weeks after the casts were removed. Normally, the majority of cases showed moderate vascular dilatation with decrease of the permeability of the vessel walls.

It cannot be positively stated that excessive dilatation represents the abnormal. It disappears with consolidation of the bone.

Closed tibial fractures have been found to show greater hyperemia and less vascular permeability than open fractures.

Vascular occlusions occurred 3 times among the 17 cases observed. The anterior tibial artery was involved in 2 cases and the posterior tibial artery in 1 case. One of the cases showed a narrowing of the fibular artery. Treatment with skeletal traction will not interfere with the circulation.

—*Otto Weiss, M.D.*

Fungus Infections of the Foot Caused by Madurella Polymorpha (Mycétome du pied a grains noirs produit par "Madurella polymorpha"). A. MAISLER, A. HULEA, A. AVRAM, and S. SPIREA. *Sem. hôp. Paris*, 1958, 34: 2116.

THE MORPHOLOGIC, BIOLOGIC, AND CLINICAL ASPECTS of Madurella polymorpha foot infections are described. The patient studied by the authors had draining fistulas of the foot for 6 years which were unaffected by chemotherapeutic agents or local excisions. Edema and multiple nodularities, some with violaceous or bluish centers, were the other characteristic lesions encountered.

The identification of the etiological fungus was difficult because of the lack of satisfactory description of the Madurella species. Some 10 different species were identified in the literature and confusing duplications were noted.

The fungus isolated by the authors had characteristics in common with Madurella mycetomi and Madurella tozeuri. Because of its variable characteristics it was named Madurella polymorpha.

The lack of clinical response to the common antibiotics is equaled by a similar resistance in vitro. Even though the Madurella polymorpha was sensitive to mycostatine in vitro, in concentrations of 0.06 mgm./ml., such concentrations could not be achieved in vivo because of their toxicity.

—*Karel B. Absolon, M.D.*

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Surgical Considerations of Occlusive Disease of the Abdominal Aorta and Iliac and Femoral Arteries: Analysis of 803 Cases. MICHAEL E. DEBAKEY, E. STANLEY CRAWFORD, DENTON A. COOLEY, and GEORGE C. MORRIS, JR. *Ann. Surg.*, 1958, 148: 306.

IT IS NOW WELL ESTABLISHED that the obstructing lesion in chronic arteriosclerotic occlusive disease of the lower extremities is frequently well localized and segmental in nature with a relatively normal patent lumen above and below the occlusive process. An analysis of the surgical experience during the past 5 years was made in 803 cases of occlusive disease of the aorta and femoral arteries.

On the basis of the clinical and pathologic features of occlusive disease of the lower extremities two major groups may be classified, namely, aortoiliac occlusion and femoral occlusion. In the former group, 448 cases, 44 per cent were characterized by complete aortic occlusion and 56 per cent by incomplete occlusion. Arteriographic studies form an important element in providing precise knowledge concerning the location and extent of the occlusive process. Three types of surgical procedures were employed, namely, thromboendarterectomy, excision with graft replacement, and the bypass graft. Lumbar sympathectomy is considered a desirable supplemental procedure in cases in which there is associated peripheral disease with secondary narrowing or occlusion in the smaller distal arterial bed.

The results of surgical treatment in aortoiliac occlusive disease have been excellent. Each of the general methods of treatment was successful in restoring pulsatile circulation through the major arterial channels in about 95 per cent of the cases. Associated cardiac and renal disease constituted the major cause of death in the operative mortality of 2.7 per cent. The long term results in these cases of aortoiliac occlusion have been most satisfactory as evidenced by the fact that recurrent occlusion was encountered in only 8 patients after varying periods following operation, ranging from 3 to 27 months.

Although wide variability exists in the nature and extent of the pathologic features of femoropopliteal occlusive disease, certain patterns of the disease may be recognized. In general they may be classified into three groups: (1) those in which the occlusive lesion is quite discrete and well localized, with relatively normal arterial elements above and below the occlusion, (2) those in which the process is much more extensive, with involvement of a considerable portion, if not most, of the superficial femoral artery, but with patency of the popliteal artery and distal arterial bed, and (3) those with still more extensive and diffuse obliterative disease extending well down into the smaller vessels of the calf. The first two types are amenable to surgical treatment directed toward restoration of the normal circulation, whereas the third type is not, and may be best treated by lumbar sympathectomy. Thromboendarterectomy may be satisfactorily employed in the first type, but in the second type the bypass graft is the procedure of choice. Of the 353 patients with occlusive disease of the femoral artery in this series, 90 per cent were treated by means of the bypass graft. Despite the greater difficulties imposed by the nature of the lesion in this form of occlusive disease as compared with the more proximal type, the results of treatment have been quite gratifying, with restoration of normal pulsatile circulation in 84 per cent of the patients. Long term results were also considered satisfactory, as evidenced by the fact that recurrent occlusion was observed in only 14 per cent of the patients, ranging over a period of 3 weeks to 38 months after discharge from the hospital. —*Robert A. Nabatoff, M.D.*

Aneurysms of the Thoracic Aorta. MICHAEL E. DEBAKEY, DENTON A. COOLEY, E. STANLEY CRAWFORD, and GEORGE C. MORRIS, JR. *J. Thorac. Surg.*, 1958, 36: 393.

DURING THE 7 YEAR PERIOD since the first successful resection of an aneurysm of the thoracic aorta, this method of therapy has been employed in 179 cases. This report is concerned with certain observations derived from an analysis of this experience, particularly in relation to methods of resection and to factors bearing upon the risk of operation.

Although the underlying principle of therapy, consisting essentially in excision of the aneurysm, is similar for all cases, the method of its application varies in accordance with the type and location of the lesion. The cases are classified into 4 groups: (1) aneurysms of the descending thoracic aorta, (2) aneurysms of the aortic arch, (3) thoracoabdominal aneurysms, and (4) dissecting aneurysms.

Group 1, comprising 73 cases, represented the largest series and reflected the relative frequency of involvement of this segment. In the application of excisional therapy, the most important consideration stems from the necessity for temporary arrest of the aortic circulation with its resulting vascular resistance upon the heart and ischemic damage to the spinal cord. A method of controlled extracorporeal circulation was developed consisting of a pump bypass in which oxygenated blood is removed from the left auricle and pumped into the aorta distal to the occluding clamps through a plastic cannula inserted upward into the left femoral artery. This method was applied in the last 36 cases in this series and the mortality was reduced from 27 per cent in the earlier series of 37 cases to 19 per cent in this more recent series. Follow-up observations extending for periods ranging from several months to more than 5 years provide highly gratifying results, revealing with few exceptions complete relief from symptoms and resumption of normal activities.

Group 2, comprising 50 cases, represented the most serious form of aortic aneurysm because of the gravity of the disease and the inherent difficulties involved in

excisional therapy. In certain sacciform aneurysms of the aortic arch, the procedure of tangential excision and aortorrhaphy may be preferable, but in fusiform aneurysms and in sacciform aneurysms in which the neck of the sac is relatively large, resection of the entire segment with graft replacement is necessary. Temporary arrest of the aortic circulation at this level interrupts the cerebral blood flow and can produce fatal ischemic damage to the central nervous system. Furthermore, a serious strain is thus placed upon the left ventricle, which may lead to acute cardiac failure. For aneurysms involving the transverse arch or the distal portion of the ascending aorta, use of a temporary shunt is considered the procedure of choice. In cases in which the proximal portion of the ascending aorta is involved, cardiopulmonary bypass by means of an artificial heart-lung apparatus is required. The total mortality in this group was 56 per cent.

The aneurysms in group 3 were significant particularly because they involved the principal vessels to the abdominal viscera, and excisional therapy was associated with the danger of producing fatal ischemic damage to the liver, kidneys, and gastrointestinal tract as a consequence of the temporary arrest of blood flow to these organs. In this group of 22 cases, syphilis was the predominant cause of the lesion. Several means, including hypothermia, controlled extracorporeal circulation, and temporary shunts, were employed to overcome the danger of damaging the sensitive abdominal organs. Recently, another method has been developed through the use of the crimped, knitted dacron tube, which permits conversion of the temporary shunt into a permanent graft. In this series there were 8 operative deaths. The results among the patients who survived were excellent.

Among the 34 cases of dissecting aneurysm, 4 involved the aortic arch and the remainder arose in the proximal segment of the descending thoracic aorta. In cases in which the dissecting process began in the ascending aorta, the procedure consisted in the creation of a re-entry passage into the true aortic lumen above, with obliteration of the false passage below. For lesions arising in the descending thoracic aorta a more curative type of procedure may be employed, consisting of excision of the segment involved in the origin of the dissecting process and replacement with a graft.

In cases in which the dissecting process is not well localized, the proximal portion is excised and the false passage below is obliterated by suture of the inner and outer wall. Aortic continuity is then restored by graft replacement. Thirty patients were treated in this manner with 8 deaths. Hypertension was highly significant, since there were no deaths in patients considered to be normotensive.

—*Robert A. Nabatoff, M.D.*

Carotid Artery Murmurs. L. E. Crevasse and R. B. Logue. *J. Am. M. Ass.*, 1958, 167: 2177.

In carotid artery insufficiency, when the collateral circulation through the opposite carotid artery and the basilar system is inadequate, a continuous murmur is produced, usually over the carotid bulb, the most common site of involvement. Routine auscultation of the head and neck can reveal a localized continuous murmur over this partially occluded carotid bulb. This may be the earliest sign of carotid artery insufficiency.

The incidence of localized carotid systolic and continuous murmurs is approximately 7 and 2 per cent, respectively, in unselected hospital patients. Partial occlusion of the carotid artery is much more common than has previously been recognized. This continuous murmur has led to the early recognition of this syndrome in: (1) completely asymptomatic patients with unsuspected carotid artery insufficiency, (2) patients in whom the diagnosis of "cerebral thrombosis" had been entertained, and (3) patients in whom transient neurological symptoms appeared, usually in relation to changes in the blood pressure.

Four case reports are presented to illustrate the authors' experience with this syndrome. Since carotid artery insufficiency is amenable both to surgery and anticoagulant therapy, its early recognition and appropriate therapy before complete thrombosis occurs may favorably influence the therapeutic results.

—*Robert A. Nabatoff, M.D.*

A Clinical and Laboratory Comparison of the Effects of Commonly Used Vasodilator Drugs on Arterial Diseases. J. Manly Stallworth, William H. Lee, Charles Belisle, and Daniel B. Nunn. *Am. Surgeon*, 1958, 24: 700.

The effect of four vasodilator drugs was determined on 15 patients with arterial peripheral vascular disease. The group was subdivided into those with pure vasospasm, of whom there were 6, those with arteriosclerosis, 3, those with Buerger's disease, and a miscellaneous group which included a sympathectomized patient with essential hypertension and a patient who had posttraumatic causalgia.

Four drugs were tested, arlidin, ilidar, priscoline, and drug 5029. Arlidin (nylidrin hydrochloride) belongs to the epinephrine—ephedrine group, and its primary sympathomimetic actions are to dilate small vessels in skeletal muscle and to increase the cardiac output. Ilidar hydrochloride (azapetine) is a dibenzazepine adrenergic-blocking drug which is described as being adrenolytic and sympatholytic. Priscoline (benzyl-imidazoline hydrochloride) is related to both sympathomimetic amines and histamines. Drug 5029 (phenoxyisopropylnorsuprifen) is a drug similar to nylidrin hydrochloride which has been studied mainly in Germany.

The controlled studies were carried out under basal conditions in a room with constant temperature and humidity. Changes in the bulbar conjunctival vessels were observed through a Leitz binocular dissecting microscope and photographed. Plethysmographic recordings of the digital pulse volumes were made. Skin and muscle temperature of the extremities at multiple sites were obtained. The drugs in most cases were given over a 30 minute period in an intravenous infusion in doses recommended by the manufacturers.

The results were not consistent and the responses not only varied between patients in the same subgroup but from one extremity to the other in the same patient. In general, ilidar and priscoline proved most effective in the majority of patients, especially in regard to the plethysmographic and temperature

studies. Arlidin and drug 5029 produced similar results but arlidin seemed to have fewer side reactions. There appeared to be an excellent correlation between the effect of these drugs on the conjunctival vessels and the small vessels in the extremities. The authors postulate that one of the reasons for the variability of response in this study is that each major system of arteries has its own "chemoreceptor mechanism".

—George R. Holswade, M.D.

Operative Technique for Internal Carotid Aneurysms Located in the Supraclinoidal Region (Technique opératoire des anévrysmes supra-clinoidiens de la carotide interne). P. WERTHEIMER and G. ALLÈGRE. *Lyon chir.*, 1958, 54: 494.

THE ANEURYSMS of the internal carotid artery which are located in the supraclinoidal region are very difficult to control because of the relative inaccessibility of the region, fragility of the aneurysmal wall, and because of the perianeurysmal reaction, especially in aneurysms of long standing. Often during the procedure the aneurysm ruptures and massive intracerebral, subarachnoidal, or subdural hemorrhage takes place.

To ensure a satisfactory surgical result the following three principles should be adhered to: (1) adequate exposure, (2) adequate preliminary hemostasis, and (3) intact cerebral circulation. A successful operation has three objectives: (1) to eliminate the compression of neighboring structures, the optic nerve, the oculomotor nerve, and the cerebral parenchyma; (2) to prevent an aneurysmal rupture; and (3) to preserve an intact arterial tree in order to prevent postoperative neurologic sequelae. To achieve these objectives the following basic operative principles were adopted: (1) resection of the tip of the temporal lobe and (2) placement of temporary clips on the internal carotid, middle cerebral, and anterior cerebral vessels.

The osteoplastic flap is outlined so that the lesser wing of the sphenoid bone projects upon the junction of the anterior third with the posterior two thirds of the flap. The base of the flap runs close to the zygoma, the posterior border 1 to 2 cm. in front of the auditory canal, the anterior border runs just behind the orbit. The height of the flap measures about 6 to 7 cm. Before the partial resection of the temporal lobe, the Sylvian fissure should be definitely identified, an important landmark for the location of the surrounding functional areas, especially on the left side. In this fashion an area of exposure measuring 4 by 5 by 5 cm. is obtained. Then the internal carotid artery with its bifurcation is exposed and temporary clips to the internal carotid, anterior, and middle cerebral arteries are applied. The aneurysm is freed from the neighboring structures and a clip applied to its neck. A small aneurysm is left in place; a large one is removed to obviate pressure damage to the neighboring structures. Then the temporary clips are removed and the closure of the incision effected.

In this fashion 30 patients were operated upon without the occurrence of disturbing hemorrhage during operation and a completely intact postoperative cerebral circulation was maintained as proved by postoperative angiography.

—Gunars Medins, M.D.

Critical Study of the Diverse Surgical Treatments of the Sequelae of Phlebitis (Etude critique des différentes thérapeutiques chirurgicales des séquelles de phlébite). R. VAN HOVE. *Acta chir. belg.*, 1958, 57: 268.

IN HIS ARTICLE in this same journal in 1953 the author stated his position with reference to the surgical therapy of swellings, ulcers, and other manifestations of the leg following phlebitis of the femoral vein. He believes, first, it is necessary to re-establish the circulatory return in the instances of total, nonrecanalized thrombosis by a venous graft; secondly, replacement of venous tracts which have become recanalized only to a caliber less than normal size is also indicated; thirdly, local sympathectomy, perivascular or lumbar, should be carried out along with the replacement.

In suggesting the limitations of surgery in these cases, he admits that the idea of restoration of the impaired return flow from the leg by means of venous grafts may be utopianism, but he does not favor the diverse venectomies, deep ligations, and varicectomies which are being currently proposed for treatment of these sequelae.

It is the author's contention that the basic factor in the etiology of these manifestations is one of hydraulics, and he produces mathematical equations similar to the formula of Bernouilli, as applied to the law of Poiseuille with reference to the flow of liquids through a tube.

In the subsequent discussion, VIGONI protests that the human being is not a favorable subject for the application of mathematically precise rules of conduct, and cites the numerous ways in which the human organism reacts to inflammation of the arteries, capillaries and lymphatics on a biologic basis, which are not amenable to a purely mechanical explanation.

Although the author admits these biologic considerations, he still insists the original etiologic factor is a purely hydraulic one, and points out that present day surgery in this field does not pay much attention to pure logic.

VAN DER STRICHT, proposes that there be a meeting of minds, not necessarily exclusively of specialists, whereby a large experience can be pooled and evaluated in an attempt to arrive at some helpful conclusions. In this field surgery competes with medical therapy which can be of marked value; the use of elastic devices, for example, is very efficacious in most cases, but the treatment may be disagreeable to the patient and is frequently abandoned.

—John W. Brennan, M.D.

Superior Vena Caval Obstruction. R. ALLANSMITH and VICTOR RICHARDS. *Am. J. Surg.*, 1958, 96: 353.

OBSTRUCTION of the superior vena cava is associated with an increase in the venous pressure of the upper half of the body, and with a gradual development of collateral circulation. The signs and symptoms result from the high superior central venous pressure. There is edema of the upper half of the body, cyanosis of the face and arms, and a visible collateral circulation. Respiratory distress, headache, and somnolence are frequent complaints. The respiratory distress is increased by the edema of the neck and glottis, plus

pleural effusions and the increase in the carbon dioxide content of the blood in the respiratory center. The eyes bulge, and the lids are edematous. There may be syncope or even convulsions. The cerebrospinal fluid pressure is elevated, and a venous pressure of 300 to 500 mm. of saline in the antecubital veins is not uncommon. All symptoms are increased by bending forward, and many of these patients sleep sitting up since they become dyspneic with recumbency, and coughing, choking, dizziness, and increased cyanosis result if they are not upright. Partial obstructions are more common than is realized, and prominent collateral vessels may be the first sign of a mediastinal lesion.

Development of the collateral pattern depends upon the site of obstruction. If obstruction includes the azygos vein, as it unfortunately usually does, the blood flow is via thoracoabdominal, vertebral, and mediastinal collateral vessels carrying blood to the femoral and iliac veins, and is prominent in a caudal direction. If occlusion is above the azygos, a prominent venous plexus develops over the sternum, blood flowing via the internal mammary and intercostal veins to the azygos system. This route is more efficient, and the signs and symptoms of such an obstruction are less severe. Pleural effusion is troublesome in this group.

Venous pressures tend to increase with exercise in the presence of a block, whereas increased venous pressure caused by heart failure does not show a significant increase with exercise.

The prognosis depends upon the cause of the obstruction, the location and rate of development of the obstruction, and the adequacy of the collateral circulation. Mediastinal tumor is still the most common single causative factor. Other causes are aortic aneurysm, mediastinitis, postirradiation fibrosis, idiopathic venous thrombosis, and phlebitis.

Nonsurgical treatment may be effective when obstruction is from aneurysm of luetic origin, from tuberculosis, bacterial mediastinitis, or lymphoma.

Surgical treatment consists of phlebotomy, which may be lifesaving when obstructive symptoms are acute, and of mediastinal decompression or vascular grafting.

Precise structural information obtained from ordinary roentgenograms, tomograms, and phlebography is of prime importance preoperatively.

Grafting procedures must be adapted to the type and location of the obstruction, and the shunt must be performed without the destruction of the collateral circulation. Since anastomoses in the venous circulation are prone to stricture and thrombosis, an everting suture should be used, and care must be taken to prevent suture material from being exposed inside the vein.

Seventeen of the 21 patients operated on by the authors had benign disease. Arterial homografts, arterial heterografts, vein autografts, prostheses, and direct anastomoses without an interposed graft were all used to provide a shunt. When it was possible anastomosis to the auricular appendage was avoided since this anastomosis tends to constrict. The intrapericardial portion of the vena cava is preferable. Nevertheless this anastomosis was necessary in a large number of cases. Adequate initial relief was obtained in all cases; however, venous pressure remained above normal in all cases.

The authors believe that more experience is necessary with this procedure. Some of their grafts are thought to have become obstructed. The follow-up is inadequate, and does not include comparisons of venous pressure, or postoperative phlebography, which are thought to be of considerable importance in such cases. —*Carl H. Calman, M.D.*

Surgery of the Leg Veins (Zur Chirurgie der Beinvenen). K. G. Eysholdt. *Chirurg*, 1958, 29: 337.

The greatest part of the venous blood flow from the lower extremity is carried by the main system of the deep anterior and posterior tibial and the fibular veins (two to each artery). This system has an enormous capacity, and the craniad current of venous blood is maintained by the interplay of arterial vis a tergo, muscular pumping, abdominal pressure differential, and venous valves. The superficial and subcutaneous system of the small and large saphenous veins, on the other hand, is connected by communicating veins to the deep system which can easily accommodate its additional volume, and thus obstructive signs will not appear even when "genuine varicose veins" of the superficial net exist. In the case of a postphlebitic syndrome the elasticity and the valves of the deep venous system are destroyed, and the heart cannot pump the blood against the prevailing hydrostatic pressure. In this situation the greater saphenous vein is not able to carry much additional load and responds to the excessive load with secondary varicosities which are always associated with peripheral venous decompensation and soft tissue edema.

The measurement of venous pressure gives useful information about possible venous disease. When a healthy person starts using the muscles of the lower extremity, the venous current is accelerated by the muscular pump, and the pressure drops by 50 to 80 per cent. This decrease is absent or of a minor degree in patients with secondary varicose veins, but appears again when the reversed downward current is interrupted by pressure over the main vein. If thrombotic obstruction is present, the pressure rises markedly. This phenomenon can be observed years after the original inflammation. As long as collateral veins can drain the surplus blood, tissue damage will be minor. In progressive cases, however, especially when phlebitic episodes recur repeatedly, capillary permeability is increased and extravasation of erythrocytes occurs causing pigmentation of the skin through hemosiderosis. At a later stage local edema favors tissue acidosis, fibrinous induration, and sclerosis of the subcutaneous tissue, and finally ulcer formation. The pathognomonic basis for these events and their possible connection with arteriovenous anastomosis or the lymph channels is not quite clear in the final analysis.

Phlebographic methods of diagnosis have recently assumed great importance and have shown, e.g., that deep calf tenderness and palpable infiltration between the gastrocnemius heads is conclusive evidence of phlebothrombosis. It is also clear that peripheral soft tissue engorgement does not occur until thrombotic obstruction of the popliteal vein has oc-

curred. Chronic backflow obstruction can best be demonstrated with Halse's technique of placing the patient in a 60 degree Fowler's position which can be overcome by the contrast medium in a given time limit.

With regard to treatment the following statements can be made: Genuine varicose veins can be removed from the general circulation without detriment. Stepwise procedures are advisable even in extensive disease. Orbach (1944) revised the intriguing air-bloc technique in which 1 c.c. of air precedes the contrast medium and clears the walls of the vein. In vein stripping it is most important to remove the side branches of the greater saphenous vein close to its entrance into the femoral vein. Large convolutes are better removed surgically. Varicose vein surgery, in summary, is indicated for large packets of veins, for full length involvement of the saphenous vein, and for purulent thrombophlebitis. In the postphlebitic syndrome untimely sclerosing of superficial veins may rob the extremities of vital collaterals. Elastic sponge rubber compresses (Sigg) have shown excellent results in some cases of edema and ulcer formation. The authors are not convinced that the problem can be solved by routine ligation of the superficial femoral vein. The best cure in this disease is certainly prophylaxis and anticoagulant therapy of thrombosis.

—*W. Dieter Bergman, M.D.*

BLOOD; TRANSFUSION

Citrate Intoxication. JOHN LUDBROOK and VICTOR WYNN. *Brit. M. J.*, 1958, 2: 523.

SEVERAL REPORTS of citrate overdosage in man have been made as the rapid infusion of large volumes of blood has become a more frequent event. Citric acid is said to form weakly dissociated salts with divalent cations and its untoward effects are generally attributed to the depression of ionization of such cations in the extracellular fluid, particularly calcium. The excitable tissues of the body are susceptible to such a depression and the effects on cardiac muscles are the most important. Under certain circumstances, that is, exchange transfusions in infants and the rapid infusion of blood or plasma particularly in the presence of disease or impaired blood supply to the liver, there may be marked elevation of the plasma citrate level. Signs attributed to citrate intoxication are muscle twitching or convulsion in the unanesthetized patient, lengthening of the QT interval leading to cardiac asystole, arterial hypotension resistant to further blood transfusions or pressor agents or possibly prolongation of clotting time.

The rapid disappearance of citrate from plasma infused intravenously over a brief period is said to be due to three mechanisms: (1) distribution throughout at least the extracellular space, (2) excretion in the urine, and (3) metabolic destruction. On the basis of animal experiments and infusions in man, the authors believe that metabolic destruction is more important as a means of removing citrate from the plasma in man than in the dog, for a given elevation of plasma citrate at the rate of metabolic destruction in man is about twice that of a dog weight for weight. The authors believe that a level of 50 mgm. per 100 c.c., giving in a normal person a calculated plasma ionized calcium of about 0.5 mgm./kgm. H_2O, may be considered at least undesirable. This corresponds in the adult to a steady rate of transfusion of citrated blood fusion of about one bottle, that is 540 c.c., in 5 minutes, a rate rarely achieved in practice.

It would appear that except at excessively rapid rates of blood infusion some defect in plasma clearance is necessary to produce dangerous levels of plasma citrate. In metabolically abnormal patients, with liver disease, anuria, (inasmuch as some 20 per cent of infused citrate is excreted), or under hypothermia, or when there is impairment of liver circulation, or application of clamps to the thoracic or high abdominal aorta, the ability to clear the plasma citrate may be so impaired as to make high plasma citrate levels a real danger. If good grounds for suspecting a high plasma citrate level exist and it is thought that this may be the reason for an otherwise unexplained hypotension or cardiac arrhythmia the logical remedy is the administration of calcium. The authors prefer calcium chloride rather than calcium glutamate on the grounds that the former is more completely ionized. The correct dose can be assessed only by the slow (0.5 to 1 c.c. per minute) intravenous injection of 10 per cent calcium chloride until the response is seen in the blood pressure or on the electrocardiogram or until 10 c.c. have been given. In surgical procedures or in other circumstances when blood may have to be given rapidly and when one or more of the circumstances which may depress the rate of clearance of citrate from the plasma are present it may be possible to avoid difficulty by having the available blood collected without the use of citrate, utilizing heparin or an iron exchange resin as recommended by Walter (1950). The authors report high plasma citrate levels occurring during the infusion of citrated blood in 4 patients undergoing surgery under hypothermia, one of whom died with signs attributable to citrate intoxication. In both dog and man hypothermia to 28 to 29 degrees C. reduced the rate of metabolic destruction by 30 to 40 per cent. —*Allan D. Callow, M.D.*

RETICULOENDOTHELIAL SYSTEM

The Treatment of Idiopathic Thrombocytopenic Purpura. E. J. WATSON-WILLIAMS, A. I. S. MACPHERSON, and STANLEY DAVIDSON. *Lancet*, Lond., 1958, 2: 221.

THIS REPORT is based on experiences with 93 patients in whom the diagnosis of thrombocytopenic purpura was established. A study of 26 of these patients who were not treated by splenectomy nor steroid therapy led to a classification of the remaining 67 into two groups, those whose history was of a duration of less than one hundred days from the onset of symptoms to the start of treatment (short history cases) and those in whom this interval was more than one hundred days (long history cases). It was felt that practically all cases of spontaneous remission would fall into the short history group. In the short history group it was inferred that permanent remissions were not the direct result of treatment with steroids, but that the onset of such remissions was hastened by steroid therapy. Splenectomy produced good results in 75 per cent of

the short history cases in which spontaneous or steroid induced remissions had not occurred. Therefore, the management of a patient with a short history of purpura should consist initially of blood transfusions and the administration of cortisone, 75 mgm. every 6 hours, or prednisolone, 15 mgm. every 6 hours, for 3 weeks. If there is no improvement in 3 weeks, splenectomy should be done.

In long history cases the chances of a spontaneous or lasting remission from steroid therapy are poor. However, it is recommended that such patients be given a 3 week course of steroid therapy, since about one-half of these patients were benefited temporarily. Splenectomy performed during this temporary remission was followed in about 50 per cent of cases by a permanent remission. —*George R. Holswade, M.D.*

MISCELLANEOUS

Aregenerative Anemia Associated with Benign Thymoma. BAYARD CLARKSON and DARWIN J. PROCKOP. *N. England J. M.*, 1958, 259: 253.

THE CASES of 14 patients with aregenerative anemia and benign thymoma have been reported in the literature and are summarized in this article. Two additional cases are reported in detail. The anemia in these cases was marked, with an average hemoglobin of 4.5 gm. per cent. Usually it was normochromic and normocytic, with reduced to absent reticulocytes. The bone marrow showed either erythroid aplasia or severe hypoplasia.

In one of the 2 cases reported the anemia did not occur until 2 years after the complete extirpation of a 1,000 gm. thymoma from the left hilus. The second patient's anemia was well advanced when a 180 gm. thymoma was removed surgically from the anterior mediastinum. Removal of the tumors in the second case had no effect on the anemia, and both of these patients have failed to respond to any form of therapy other than repeated transfusions.

An extract prepared from the tumor in the second case was given intravenously for 10 days to a dog that had previously been given acetyl-phenyl-hydrazine to induce an anemia and erythroid hyperplasia. This treatment failed to suppress reticulocytosis and erythopoiesis, and the dog's hemoglobin returned to normal. There is no evidence that the thymoma causes the anemia directly. The authors postulate that some unrecognized endocrine factor may be responsible for both the thymoma and the anemia.

—*George R. Holswade, M.D.*

Thrombolysis with Fibrinolysin (Plasmin), New Therapeutic Approach to Thromboembolism. K. M. MOSER. *J. Am. M. Ass.*, 1958, 167: 1695.

FIBRINOLYSIN (plasmin) is the most effective of a group of materials called fibrinolytic agents because by their action on the fibrin framework of a thrombus they are capable of acutely dissolving clots within the vascular system. The most purified form of fibrinolysin is obtained from human and bovine plasma; profibrinolysin can be obtained from the globulin fraction of the plasma proteins, and this is activated to fibrinolysin by small amounts of streptokinase.

At the District of Columbia General Hospital 52 patients with various forms of thromboembolism have been treated with fibrinolysin given intravenously. In one half of the patients a febrile reaction developed, and this appears to be the greatest objection to its use. Because of the danger of a febrile response, the drug was used in only one patient with coronary thrombosis. The authors suggest that febrile reactions may result from the protein fractions released when fibrinolysin acts upon fibrins. The dosage varied from 30,000 to 90,000 fibrinolysin units (F. U.), and when the dosages were between 40,000 and 50,000 (F. U.), 92 per cent of the recipients manifested an enhanced plasma fibrinolytic activity at some time after the infusion. No embolic phenomena occurred after fibrinolytic treatment. There was no clinically significant derangement of the coagulation process and no hemorrhagic complications occurred. Twenty-nine patients simultaneously received anticoagulant drugs, also without any hemorrhagic sequelae.

Ten case reports illustrate symptomatic improvement after treatment in patients with deep venous thrombophlebitis, pulmonary embolism, peripheral arterial occlusion, coronary thrombosis, cerebral arterial occlusion, and superficial thrombophlebitis. The authors believe that even though these results are encouraging, firm conclusions regarding the therapeutic value of fibrinolysin must await completion of large-scale controlled studies.

—*George R. Holswade, M.D.*

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

The Conservative Treatment of Hemangiomas in Infants and Children. HARRY M. BLACKFIELD, FRANCES A. TORREY, WILLIAM J. MORRIS, and BERTRAM V. A. LOW BEER. *J. Internat. Coll. Surgeons*, 1958, 30: 255.

SPONTANEOUS INVOLUTION of hemangiomas of infancy and childhood was noted in medical literature as long ago as 1888, however, it has not been until recently that adequate notice was taken of this fact. A study of more than 700 cases of hemangioma at the University of California Medical Center and the Franklin Hospital, San Francisco, indicates that spontaneous involution of the most common hemangiomas of infancy and childhood must be accepted as a fact.

Included in the involuting group are superficial, combined, and deep lesions that appear at birth or soon after. Shortly after their appearance a period of rapid growth ensues that may last 3 to 9 months. The tumor may expand to frightening proportions during the period of growth. With small superficial lesions, involution may be complete within a year or two. The regression of large tumors may show a relaxation of the skin that will require surgical revision.

Not all of the hemangiomas observed in infants and children are of the involuting type. The port-wine stain is the most common of these. Treatment of large lesions is a difficult problem. True cavernous lesions usually grow slowly, and may accelerate with puberty. Excision is the procedure of choice. Malignant lesions are extremely rare.

When surgical intervention is forced by parental pressure, and attempted in the growing phase, the tumor can rarely be excised completely. Growth continues in the residual vascular tissue until the latent period is reached. If operation is delayed until involution has started, a more conservative excision is possible, since the residual vascular tissue resolves spontaneously.

Radical methods of treatment that may damage or prevent the growth of normal tissues are contraindicated. —*Carl H. Calman, M.D.*

Plastic Repair of Heel Defects (Zur plastischen Deckung von Fersendefekten). MAX ALEXANDER SCHMID. *Langenbecks Arch. u Deut. Zschr.*, 1958, 288: 256.

THE REPAIR of heel defects by plastic procedures is somewhat limited because of pressure and traction in this region which furthermore provides a poor bed for a graft. Healing is delayed because of poor circulation, venous stasis, and a tendency to edema and diminished arterial blood supply. These local conditions permit at most the utilization of a thin Thiersch flap which would be functionally inadequate. Neither the three-quarter flap nor the Reverdin plastic procedure can be applied. Three illustrative cases are described in detail. In the first case with use of a Thiersch flap, the cosmetic result was satisfactory, but functional results were poor with recurring inflammation and other local disturbances. In the second case a Reverdin flap yielded poor cosmetic results with good functional results. In the third case a defect due to traumatic ulcer of the heel was repaired by mobilization of the margins of the defect following lateral incisions to relieve tension. Here too, the cosmetic result was satisfactory but the functional result poor.

Pedicled flaps would therefore seem to hold better promise of success in this region, since they have the advantage of elasticity and subcutaneous cushioning which offers protection against pressure, traction, or blows. They do not interfere with mobility of the joint. Following a brief discussion of the disadvantages of other types of plastic procedure, the author recommends and describes the simple direct transplantation of a pedicled flap. At the first sitting the donor site is covered leaving no open wound surface, secretion, or infection. With the whole sound leg and homolateral buttock available for the flap, the surgeon can make his choice according to optimum conditions and cosmetic wishes of the patient. The technique and results of this procedure are illustrated in 2 cases.

Following traumatic destruction of the soft tissues of the heel from the tendon of Achilles almost to the middle of the sole, dead tissue was removed by electrosurgery and the defect covered with a simple pedicled flap from the contralateral thigh. Functional results were excellent in both cases, and cosmetic results were very good in one and satisfactory in the other. Complete function and the ability to work were restored. In spite of the 3 to 4 weeks in bed, direct transplantation of a pedicled flap is therefore considered the best method for covering heel defects. Good results have been obtained with flaps from the homolateral buttock, but this procedure requires maximal bending of the knee joint and abdominal decubitus for a long period. Other methods have been suggested, such as taking the flap from the arch of the contralateral sole. In symmetrical defects, the skin could thus be taken from alternate sides. The fixation bandages required for about 3 weeks hardly interfere with mobility of the larger joints of the leg.

The well known rules for plastic surgery in general must be observed in all methods especially as regards blood supply, covering of the wound surfaces with epidermis, and proper fixation with casts or bandages following proper cushioning. It is also important that the operative field be easily accessible for postoperative observation, and that venous outflow be facilitated by proper positioning, timely cutting of the pedicle in several sittings, and proper nursing. Preoperative and postoperative treatment are of equal importance, with special stress on immobilization, elevation of the foot, and radial and annular incisions of the margin of the ulcer combined with circuminjections of novocain and compresses saturated with the patient's own blood. Proper administration and application of antibiotics following sensitivity tests are recommended. Following the operation attention must be directed toward hardening the transplanted skin with vas-

cular gymnastics to restore circulation and general gymnastics to restore mobility of the joints and function. —*Edith Schanche Moore*

Significance of the Fall of Serum Sodium Following Operative Trauma. CARL H. ALMOND and ROBERT E. L. BERRY. *Arch. Surg.*, 1958, 77: 345.

THE EXCHANGEABILITY of sodium^{22} (Na^{22}), serum sodium concentration, and serum osmolalities were studied in 6 patients during the immediate postoperative period.

The conclusions are that during the first 24 hours the percentage exchangeability of Na^{22} is considerably greater than the fall in serum sodium and the osmolality when conventional fluids are used. In dehydration and while withholding fluids in this postoperative period, there were very few changes in any of the factors studied.

It is probable that the fall in serum sodium during the postoperative period is principally a dilutional effect initiated by the parenteral fluids and augmented by the internal shifts of water and electrolytes. The fall in serum sodium concentration is, for the most part, self-limiting and self-correctable and parenteral replacement of the sodium is probably not necessary and can even be dangerous.

—*Harold M. Unger, M.D.*

The Use of Continuous Suction Under Skin Flaps. R. M. MCFARLANE. *Brit. J. Plast. Surg.*, 1958, 11: 77.

THE USE OF continuous suction under skin flaps in a wide variety of plastic surgical procedures is described. This technique is applicable to cases in which postoperative collections of blood or tissue fluid are likely to occur and in which pressure dressings are impossible or undesirable. However, the use of continuous suction is not a substitute for adequate hemostasis before wound closure. In all of these cases an air tight closure of the wound was performed so that the suction functioned on firm application of the skin flap on its underlying bed.

In the technique described, suction tubing was introduced through a stab wound away from the flap rather than through the flap or the suture line. When large vessels were exposed, the tube was placed parallel to, rather than across, such vessels. A pressure dressing or simple drainage was not used in these cases. Some of the wounds were lightly dressed, but for most of them no dressing whatever was used. The tubes were not irrigated at any time after closure of the wound. Standard rubber catheters, polyvinyl chloride, and polyethylene plastic tubing were used. The tube was split along its long axis except for the distal few millimeters. During closure of the wound suction was obtained from the standard operating room units. In the wards a suction apparatus was used which maintained a steady negative pressure up to a maximum of approximately 25 cm. of mercury.

The results with the use of this technique in 14 cases are described. These cases included various types of rotation flaps on the neck, forehead, and abdomen; Z-plasty of the axilla; radical neck dissections; and cross leg flaps. There was one complication, a wound infection, which did not interfere with the healing or ultimate result. In no case did hematomas or collections of serum develop under the flaps, and all of the wounds healed per primam.

Although one patient complained of pain caused by the tubes, the discomfort and inconvenience of bulky pressure dressings were avoided and the flaps were readily inspected for viability. The use of suction acted in place of a pressure dressing to hold the flaps securely in place and also acted as an active drainage system, in contrast to the passive action of conventional drains. A number of illustrations demonstrating the results obtained strikingly verify the statements in the text. —*E. Thomas Boles, Jr., M.D.*

Studies During the Immediate Postoperative Period Following Total Body Perfusion. EDWARD C. MATTHEWS, LELAND C. CLARK, F. KATHRYN EDWARDS, SAMUEL KAPLAN, and JAMES A. HELMSWORTH. *Arch. Surg.*, 1958, 77: 313.

PHYSIOLOGICAL STUDIES carried out after total body perfusion for open cardiotomy are designed principally to give proper direction of the postoperative care, but they also give a clue as to the adequacy of perfusion and the functional state of the cardiopulmonary systems.

In the postoperative period blood samples were taken hourly from all of the patients for a period of 4 to 6 hours following the use of the Clark oxygenator pump. Determinations of the pH and oxygen tension were performed. The carbon dioxide content and tension were measured in 6 of the patients.

Other investigators, using lower perfusion rates than the authors, have reported metabolic acidosis shortly after perfusion. The data from this study indicate that if patients are perfused with fully oxygenated blood of normal pH at a rate which yields venous oxygen saturations in excess of 50 per cent, metabolic acidosis does not occur. Furthermore, there is no need to perfuse at an alkaline pH in anticipation of this acidosis or to administer alkali in the postoperative period. Certain sudden postoperative deaths, ascribed by others to oxygen toxicity, have not occurred in these patients who were perfused at arterial oxygen tensions in excess of 500 mm. —*Harold M. Unger, M.D.*

The Use of Stored Cutaneous Autografts in Wound Treatment. IRVING FEUER and M. S. DEWEESE. *Surgery*, 1958, 44: 540.

STORED CUTANEOUS AUTOGRAFTS remain viable for periods up to 3 months.

At the University of Michigan Hospital in Ann Arbor, excess skin is taken at the original debridement or grafting of burns and other wounds. The excess skin is stored at 4 degrees Centigrade in a sterile jar containing "skin bank fluid." If skin is needed at a later date to cover residual defects or areas in which the original graft did not survive, the stored autograft is applied using sterile technique on the ward without anesthesia.

The "skin bank fluid" consists of Hank's tissue culture reagents (Hanks, J. H., and Wallace, R. E.: *Proc. Soc. Exp. Biol.*, N.Y., 1949, 71: 196), plasma 20 per cent by volume (blood type AB positive), and neomycin 500 mcg. per milliliter.

In the cases reported, results were generally satisfactory with skin that had been stored from 7 to 23

days. Stored skin remained viable, as shown by microscopic examination, up to 3 months.

—*Lockert B. Mason, M.D.*

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

What First Aid Is to Be Expected Today from the Physician at the Site of Accident (Welche erste Hilfe kann heute vom Arzt am Unfallort erwartet werden?). H. P. HARFELDT. *Medizinische*, 1958, p. 1043.

THE INCREASING INCIDENCE and severity of industrial and traffic accidents emphasizes the need for immediate medical care at the site of the accident. Such aid must include (1) relief of pain by application of initial bandage splinting and positioning; (2) support of the circulation; (3) proper positioning of the patient; (4) cleansing and keeping permeable the upper respiratory passages; and (5) revivification and restoration of oxygen metabolism at the site of the accident and its maintenance during transportation to the nearest hospital. These precautions will serve to prevent shock. The physician must decide whether the patient will be able to stand transportation. The general condition will usually become worse en route to the hospital. Moving the patient too soon may exacerbate his condition or prove fatal if insufficient time has been given for restoration of the circulation or the air passages have not been cleared. In providing for pain relief, it must be kept in mind that such relief will follow only 30 to 40 minutes after subcutaneous injection, 20 to 30 minutes after intramuscular injection, and 5 minutes after intravenous injection. Not every patient will require immediate pain relief. During wound stupor there is practically no pain, and in cases of shock psychic measures are more important than pain relief. Analgesics should be administered only if internal injuries can be excluded, and if used should preferably be administered intravenously, since delayed resorption of subcutaneous and intramuscular analgesics may lead to dangerous cumulative effects while examining the patient under narcosis.

"Dolantin" in a dosage according to age, weight, and general condition of the patient is the analgesic of choice. If "dolantin" is contraindicated an intravenous injection of "megaphen" and "atosil" may be used. It is best to inject the mixture half intravenously and half diluted in an infusion. The active dose is 1 mgm./kgm. In the presence of shock or threatened circulatory collapse it is dangerous to administer central or peripheral circulatory agents. It is important to recognize shock due to injury. Following severe blood loss, the acute oxygen deficiency will not be demonstrable by a blue discoloration of the skin. The injured patient will be more likely to have a pale gray appearance, and eventually collapse occurs as a result of blood volume deficiency. This condition must be recognized to be treated. Successful treatment includes infusions and transfusions to be given later in the hospital. Natural or artificial colloid solutions stabilize the circulation and insure oxygen supply to vital organs.

The dorsal position is best for the patient. The prone position is advisable only if internal injuries can be excluded and in fractures of the ribs, pelvis, or spine may lead to exacerbation. With the patient in the dorsal position raising one shoulder and turning the head may facilitate the expulsion of vomitus. The mouth and pharynx must be kept free. If the tongue shows a tendency to fall back, a rubber tube should be inserted through the mouth or nose to permit unobstructed inhalation and exhalation. Dentures and broken teeth must be removed. Until the tube can be inserted, the teeth must be kept apart. Although intubation at the site of injury is difficult, it can sometimes prove life saving, and is less dangerous than an emergency tracheotomy. If intubation is possible it is superior to any other form of artificial respiration. Artificial respiration in the ordinary sense must be continued until normal respiration is restored. Analeptics should not be administered in oxygen deficiency since they will not stimulate the respiratory center. Administration of oxygen is the proper treatment. Various apparatus for maintaining artificial respiration may be used. —*Edith Schanche Moore.*

First Aid Measures in Accident Cases and Preparation for Narcosis Following Admission to the Hospital (Erste aerztliche Massnahmen bei Unfallverletzten nach der Krankenhausaufnahme und Vorbereitung zur Narkose). H. J. THUM. *Medizinische*, 1958, p. 1045.

IF THE victim's general condition has changed during the period elapsing between the time of injury and his admission to the hospital, this should be attended to, if possible, during preparation for narcosis. Upon admission, the general condition of the patient and the type of injury must be determined. Treatment to maintain or restore circulation and to relieve pain is the first prerequisite. Restoration of body heat and proper positioning may be followed by laboratory examinations.

In treatment the restoration of blood volume comes first. Blood substitutes can be used for this purpose and also to prevent threatening shock. The blood group, hemoglobin content, and hematocrit findings must be determined. If the circulation does not respond adequately to infusion of the blood substitute, another substitute should be selected according to the laboratory findings. When the hematocrit rises and returns to normal no further infusion is indicated, and should further infusion be indicated it is best to make use of another blood substitute. Careful observation of the condition of the blood and circulation is important especially in burn victims.

If the blood pressure fails to respond to blood transfusion, arterenol may be given to raise the blood pressure in preference to adrenalin. The patient may be given an infusion of 1 or 2 ampules of arterenol, the number of drops being regulated by the rise in blood pressure. Too great a rise in blood pressure is not desirable. The patient must be kept under constant observation.

Analgesics can usually be administered together with circulatory restoratives, except in injuries of the chest and abdomen in which relief of pain should follow diagnosis since the pain may prove a useful guide. "Megaphen," 1 mgm./kgm., may be given for psychic shock and "dolantin" and "megaphen" mixed for relief of pain. In shock the head should not be raised

and in the unconscious the head should be turned sideways and the opposite shoulder raised, to facilitate expectoration and prevent aspiration. Pain on respiration in chest injuries may be relieved by placing the patient in the sitting position, with arms raised and administration of oxygen. In the presence of an increased metabolic rate and muscle tremors as a reaction to loss of body heat with consequent slowing of the heart action, heat should be applied by means of covers, hot water bottles, or heat lamps. However a rise in body temperature above 37 degrees is not desirable. Laboratory tests in accident cases should be limited to those taking the least time and most generally known and those requiring more time should be put off when possible. The former include determination of blood groups, crossing of donor sera and erythrocytes as well as receptor sera and erythrocytes, determination of the Rh factor, hemoglobin and hematocrit indices, number of leucocytes, and examination of the urine for protein and sugar as well as sediment. Even in slight blunt abdominal injuries a urinalysis is indicated and the presence of erythrocytes in the urinary sediment should indicate a reexamination of the patient within the next 24 hours.

In unconscious patients, the loss of reflexes for coughing, swallowing, and sneezing involve danger of aspiration of vomitus and blood leading to aspiration pneumonia and lung abscess. Care must be taken to liberate the respiratory passages by removal of dentures or broken teeth or of vomitus or blood. If vomiting persists it may be necessary to empty the stomach, and the head should be placed so as to prevent further aspiration.

If unconsciousness persists for more than 4 hours, intubation is indicated with the administration of moistened oxygen. The tube should not be left in situ for more than 4 hours, because of the danger of ulceration of the tracheal mucosa. After this period tracheotomy is indicated. The air admitted must be moistened, preferably by insertion of a wet piece of gauze over the opening of the tracheotomy cannula. The oxygen also should be moistened. Victims of skull injuries respond nicely to "megaphen." Morphine is contraindicated, because it may depress respiration. "Dolantin" may also be used, but an attempt should be made to avoid analgesics. —*Edith Schanche Moore.*

Explosion Foot (Le pied de mine). R. Boron, A. Fabre, F. Rouffilange, and R. Demarty. *Presse méd.*, 1958, 66: 1329.

The French have obtained considerable information about the effects of explosion upon the foot during the campaigns in Indochina. The injury has become known as "pied de mine," since the most common cause is stepping on or near an explosive mine. This article is essentially a general review of the problem.

Under the circumstances infection has been an extremely important factor. The cases are divided into acute and late types. The classification used is one based on the anatomic and physiologic changes that occur. The actual classifications are based upon the bony structure and whether or not there is vascular damage. The treatment suggested is energetic, but depends entirely upon the nature of the anatomic and physiologic change.

In the late cases the classification depends entirely on what damage has occurred, its location, and the treatment required on the basis of commonly accepted orthopedic principles. The use of pins, particularly in fractures involving the calcaneus, is much favored by the authors; pinning into the talus or the cuboid being used.

One might comment that this is not so much a syndrome as it is a heterogeneous collection of orthopedic problems with common ideology. No cases are presented; this is a general teaching article.

—*Roger H. L. Wilson, M.D.*

The Management of Decubitus Ulcers in the Paraplegic. John A. Snell. *Med. J. Australia*, 1958, 2: 109.

With the establishment of special teams and centers to care for the paraplegics of World War II much experience was gained in the care of these patients. The cause of decubitus ulcers in these patients is mainly pressure, although various other factors play a contributory part, such as: (1) immobility of the patient; (2) loss of sensation below the level of the lesion; (3) vasomotor paralysis, especially in high cord lesions; (4) bony prominences, notably the sacrum, ischia, trochanters, and calcanea; and (5) poor general nutrition. During the past 10 years the common sites for decubitus ulcers have changed because the present practice has the patient spend most of his time either in a wheel chair or walking in calipers. The author notes that ischial-bearing, ring-topped calipers should be avoided whenever possible, and either the bucket-topped or band-topped type should be used. He thinks that with proper care and management it should be possible to eliminate sacral and trochanteric ulcers completely, these being the result of inadequate treatment, and that in the future only ischial ulcers should require treatment in the properly managed patient. Even the last are avoidable with proper care and education of the patient. This article deals only with the management of sacral, ischial, and trochanteric ulcers.

Since the blood supply to the skin is better than that of the subcutaneous tissue, one often sees a small skin sinus leading to an enormous cavity beneath with wide undermining, usually with exposed bone in the floor. In a high percentage of cases there is osteomyelitis or degeneration and fibrosis of the underlying bone. One may be lulled into a sense of false security by the small external opening. The underlying osteomyelitis may be accompanied by a profound septic absorption and a corresponding grave effect on the general health of the patient. The author recommends x-ray examination of the underlying bone in all cases. Whenever there is any doubt of the extent of the subcutaneous cavity he advocates the use of radiopaque material in the examination.

Prophylactic treatment essentially consists of the following: (1) the maintenance of the general health of the patient with a protein-rich diet and with vitamin supplements; (2) maintenance of the hemoglobin level at a minimum of 12 grams per centum (whole blood transfusions have a wide application and are freely used); (3) care of the bowels and bladder; and (4) care of the skin. The paralyzed patient must be turned every 2 hours, day and night, in order to ob-

viate pressure necrosis. Frequent back toilets produce only moist conditions, conducive to infection. The author believes they are unnecessary and are to be condemned, and advocates instead a simple daily wash with soap and water and careful drying and powdering. Wet or damp bed clothes should be changed immediately. Strong antiseptic lotions are unnecessary and may be harmful.

If kept clean and free from pressure, many ulcers will heal spontaneously. However, if an ulcer is allowed to persist there is a vicious train of pressure, ulceration, infection, toxicity, loss of protein (up to 50 grams per day), hypoproteinemia, and poor general nutrition. Unless this course is arrested death is not long in following.

Infection may later be cleared up by frequent dressings, and healing can be achieved by the use of the small split-thickness skin graft. This procedure is very useful and may be all that is required for sacral sores. However, should the skin covering be insufficient then flap repair can be undertaken on a clean area without risk of infection. Ischial and trochanteric sores, however, are frequently grossly undermined and healing cannot be obtained without excision of the ulcer. Again with frequent dressings, infection can be controlled and surgical treatment be carried out. The author lists the following criteria as being necessary before operation is undertaken: (1) the patient must have a minimum hemoglobin level of 12 grams per cent; (2) he must be thriving on a protein-rich diet of high caloric value; (3) the ulcer must be commencing to heal spontaneously; (4) urinary infection must not be present; (5) the ulcer must be clean locally, as outlined previously; and (6) there must be no muscle spasms which would be liable to produce shearing of the graft at the operative site. Anterior rhizotomy or neurotomy may be required at times to correct these spasms.

In the surgical treatment of decubitus ulcers, excision and direct suture have been used, but generally this has been found to be inadequate and recurrence rapid. Closure by flaps is feasible, but since one of the causative factors, i.e., the presence of underlying bony prominences is still present, recurrences occur. With excision of the underlying bony prominence the results have been improved. To achieve success in the surgery of the ulcer, the author thinks that the following principles should be adhered to: (1) the ulcer must be excised in toto; (2) if the bony prominence is at all marked or is diseased, it should be removed and smoothed; (3) hemostasis must be absolute; (4) all flaps should be drained for 48 to 72 hours to avoid postoperative oozing of blood and serum; (5) the wound should be repaired in layers without tension and with the finest sutures and instruments (if possible the various layers of the wound should be staggered and interdigitated in order to avoid superimposition of the suture lines); (6) flap repair is preferable to direct suture, since one is not left with a scar directly overlying an area which has to withstand pressure; (7) the site of repair should be kept free from pressure for at least 4 weeks in order to allow it to heal firmly before subjecting it to trauma; and (8) sutures should be left in for a minimum of 10 days, provided they are not infected or cutting in. Details are given for the management, particularly of sacral, trochanteric, and ischial ulcers in accordance with the principles outlined.

In his series the author presents a total of 29 operations carried out on 23 ulcers in 16 patients. There were 12 ischial, 6 sacral, and 5 trochanteric ulcers. Four of the ischial ulcers were treated before the importance of removing infected and prominent bone was realized. In these cases the patients have since had a further operation with the offending bone removed, and all of the wounds are now healed and stable.

—*Wayne F. Cameron, M.D.*

Studies of Theatre Ventilation and Surgical Wound Infection. J. B. KINMONTH, R. HARE, G. D. TRACY, C. G. A. THOMAS and Others. *Brit. M. J.*, 1958, 2: 407.

THE BACTERIAL CONTENT of the air of an operating theatre decreased following the introduction of a cross-draught of fresh filtered air over the operating table. This reduction in bacterial content occurred in a theatre in which a plenum positive-pressure system was already in operation. No corresponding reduction occurred in the rate of postoperative wound sepsis in patients operated upon in this theatre.

The presence of wound infection can be attributed to several possible causes. One which was considered to be important in this study was the acquisition of hospital staphylococci by patients in the wards before operation. Many patients were found at operation to be carriers of the organism in the nose, on the bedclothes, or on the skin.

Reduction of the bacterial content of the air in operating theatres is desirable as a general principle, but is unlikely by itself to eliminate infection.

There is a need for a simple and practical test to detect the more dangerous carriers of organisms in hospitals.

—*John J. Maloney, M.D.*

Fatal Sepsis Following Slight Injuries (Toedliche Sepsis nach banalen Verletzungen). E. SCHIMA. *Klin. Med.*, Wien., 1958, 13: 193.

AT THE Surgical Clinic of Vienna, before the discovery of penicillin, the mortality rate following slight injuries amounted to 1 to 2 deaths annually. In 1945 however, during a period of great material and psychic distress, there were 14 deaths due to slight injuries. Of these 14 patients, 8 died of sepsis, 5 of pneumonia, and one of pulmonary embolism. Since the advent of antibiotics only one case of death due to slight injury has been encountered. The death was that of a young healthy man and was the result of an almost ridiculously insignificant injury. The patient was 34 years of age and showed no evidence of diminished resistance. His history revealed thrombophlebitis of both legs in 1936, shell wounds of both legs in the years 1942, 1944, and 1945 with an ulcer in one of the scars, and in 1953 a contusion of the right knee with slight joint effusion.

In the spring of 1956, the patient hurt his little finger on a nail which protruded from a chest. The wound was immediately iodized. The following day he bumped his knee against a chest, resulting in no skin abrasion but only a slight swelling and pain. On the following day the pain in his little finger grew worse and he applied an ointment. Later he noted red streaks on his forearm and sought medical ad-

vice. Two days later, following a diagnosis of paronychia of the left fifth finger, the nail was removed, the nail wall incised, and a finger splint applied. On the following day he complained of increasing pain in his right knee with gradual reddening of the skin about the knee and on the internal aspect of the thigh. Two days later, he had chills and a fever of more than 39 degrees C. The following day he was sent to the hospital.

On the day of admission he received 200,000 units of penicillin intramuscularly every 4 hours, streptomycin 1.0 gm. intramuscularly twice daily, and one ampule of "solusopronal" intravenously as well as circulatory support with "cedilanid," "movellan," and "gerobit." He became delirious. On the following day, he was given the same treatment plus 2 doses of 1 tablet of "perthrombon," infusion of physiologic saline solution, dextrose, and vitamins. His temperature was 39 degrees C., and he complained of vague pains in his chest. Auscultation revealed slight murmurs over both lung bases. Puncture of the right knee joint yielded negative results. The same treatment was continued on the following day. The leucocyte count was 18,400; the temperature was 39.2 degrees C.

Roentgen examination of the lungs revealed pulmonary congestion. On the following day the same treatment was continued with venesection of 100 c.c. of blood and transfusion of 250 c.c. of stored blood. Dermatologic findings included thrombophlebitis but no signs of erysipelas. On the next day, instead of penicillin and streptomycin every 4 hrs., the patient was given 100 mgm. of "hostacyclin" (tetracycline Hoechst) intramuscularly, and instead of "perthrombon" twice daily, one ampule of thrombocid. His temperature was 38.9 degrees C. and he no longer responded when addressed. On May 20, his temperature rose to 40.3 degrees C. and he died.

Autopsy revealed panaritium osseum of the terminal phalanx of the left little finger. In the right knee joint there were dark hemorrhagic masses and the joint cartilage was largely destroyed. The right vena saphena magna was completely filled with purulently decomposed thrombi. Metastatic abscesses and purulent infarcts were found in all the pulmonary lobes. The spleen revealed an acute septic tumor. Bacteriologic examination revealed gram-positive cocci in conglomerations and short chains in smears from the terminal phalanx of the left little finger, the pulmonary abscesses, and purulent thrombi of the vena saphena. Culture from the spleen was aerobic and yielded Staphylococcus albus and aureus, sensitive to tetracycline and supronal, resistant to penicillin and streptomycin.

In this case it was not possible, as is required today, to use antibiotics only after identification of the organism and testing its resistance. The fact that the postmortem organisms were resistant to penicillin and streptomycin would not indicate that such treatment was useless since sensitive germs had probably already been destroyed by preliminary treatment. It is impossible to bring a sufficient concentration of antibiotics into veins filled with purulent thrombi since they are inaccessible to the circulation. Removal of the septic focus to prevent sepsis might have been accomplished in this case by early high thigh amputation with ligation of the vena saphena at its origin. A warning is therefore issued against too long postponement of amputation while relying on antibiotics. The cure of severe thrombophlebitic sepsis by antibiotic therapy alone is so rare that single cases are published. —*Edith Schanche Moore.*

Tropical Phagedenic Ulcer. GEORGE BLAINE. *Ann. Surg.*, 1958, 148: 281.

TROPICAL PHAGEDENIC ULCER is a rapidly spreading ulcer occurring on the lower extremities. It quickly assumes a phagedenic character and is accompanied by pain, local edema, sloughing, and a serosanguinous and foul-smelling discharge. The edges of the ulcer are undermined and the margins raised. It is ubiquitous in tropical and subtropical zones.

An important etiologic factor is lack of footwear. The lesion starts as a small surface wound caused by a cut, abrasion, or insect bite. Within 2 or 3 days it develops into a typical spreading ulcer. The bacteriology is nonspecific. Fusiform bacilli, Borrelia vincentii, are demonstrable in most cases. A variety of other bacteria is found. Usually, the ulcer has a surface pseudomembrane. The base of the ulcer has a cartilagelike appearance with a reduced tendency to bleed.

This disease should be differentiated from stasis ulcer, elephantiasis nostras, cutaneous leishmaniasis, yaws, and other types of cutaneous granulomas.

Two hundred cases are the subject of the present report. Twenty-five per cent had associated lymphadenitis.

Treatment consisted of the use of a powder containing hyaluronidase, bacitracin, polymyxin B, and neomycin. After one treatment the ulcer ceased to spread; the slough either disappeared or separated; the ulcer edge became pink and started proliferating. After 2 weeks re-epithelialization was in progress. In 3 to 4 weeks many of the ulcers were healed.

Another valuable effect of the powder was the elimination of the putrid odor of the ulcer.

The powder was much more effective than a variety of other powders, enzymes, and antibiotics applied locally. —*Frederick W. Preston, M.D.*

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Roentgenologic Examination of the Mammary Gland (Zur Roentgenuntersuchung der Mamma). K. Werner, D. Buttenberg, and H. Zeitz. *Fortschr. Roentgenstrahl.*, 1958, 88: 690.

Because of the lack of a method of examination for the diagnosis of early cancer of the breast comparable with the colposcopic and vaginal cytologic techniques for diagnosis of malignant disease in the female genitalia, the authors have been attempting to develop an adequate substitute by means of a roentgenologic method.

Their studies are based on the work of previous researchers, notably Gershon-Cohen *et al.*, who, in turn, followed the original work of R. Leborgne (*Am. J. Roentg.*, 1951, 65: 1).

The authors use a long metallic tube (75 cm.) between the roentgen tube and the breast so as to exclude secondary rays. The end of the tube is covered with a plastic cap so as to carry out the exposure under light compression, and procure an even distribution of the breast tissue. The usual voltage has been 30 to 45 kilovolts; in unusually voluminous breasts it has been increased to as much as 200 to 400 kilovolts. The exposures have been made in both a craniocaudal and a laterolateral direction.

The apparatus used has been that of Siemens because of its smaller focal area and greater efficiency (30 milliamperes per second). If this standard procedure does not give satisfactory results a smaller tube is employed with special diaphragming.

No extensive work has been carried out to test the methods discussed in the detection of occult carcinoma of the breast, but the results which can be obtained are shown in a series of roentgenograms which were prepared in 2 cases of known and clinically recognizable breast cancer.

The authors favor the LogEtronic apparatus and hope with its aid to be able to develop a method which will permit an earlier roentgenologic diagnosis of breast tumors. —*John W. Brennan, M.D.*

Postpneumonic Pseudoaircysts in Children (Ueber postpneumonische Pseudoluftzysten beim Kind). K. Schlager. *Fortsch. Roentgenstrahl.*, 1958, 89: 136.

The author, of the Central X-ray Institute of the Wilhelmina Hospital at Vienna, Austria, discusses the pathogenesis and radiologic appearance of cystlike air-filled cavities occurring during or after pneumonia in children.

These phenomena have been described under various names by different authors: tension bullae, valvular cysts, localized or bullous emphysema, and pneumatocele. The author of this article suggests the term: "postpneumonic pseudoaircyst" (PPC). It occurs predominantly in infants and small children and is characterized by considerable variation in size, absence of clinical symptoms, and spontaneous disappearance without therapy.

The pathogenesis is discussed in detail. Most workers assume that an organic or functional (spastic) stenosis of a smaller bronchus is the primary cause. This stenosis has a valvelike effect and leads to local emphysema of the distal lobuli and alveoli which have previously been damaged by the inflammatory process.

Another possibility is the formation of an air-filled cavity at the site of a gangrenous or purulent necrosis proximal to a bronchial stenosis.

It has not been determined yet whether the pseudocyst is filled with air during inspiration or expiration. Exploratory puncture of the cavity is contraindicated because of the danger of lung collapse, pneumothorax, or infection; therefore, exact recording of the pressure changes within the cavity is not possible. The author conjectures that in forced expiration, especially during a coughing spell, the valve mechanism of the stenosis is overcome and air is pressed into the poststenotic area.

The roentgenologic findings are very characteristic. The "cyst" is regular, ball-shaped, or slightly oval. The wall is sharply defined, thin, as if drawn with a pencil. Fluid levels are rare but may occur occasionally. The size may vary considerably in the same patient from day to day.

The cysts always disappear spontaneously.

Four pertinent cases with instructive roentgenograms are presented. —*Werner M. Solmitz, M.D.*

Diagnosis of Lymphnode-Bronchial Perforation by Means of Tomography (Diagnostik von Lymphknoten-Bronchus-Perforationen durch Schichtaufnahmen). J. Gallas and A. Tománek. *Fortschr. Roentgenstrahl.*, 1958, 88: 699.

Tomographic studies have been made of 320 institutionalized patients at the Institute for Tuberculosis Research in Prague, Czechoslovakia. The authors encountered 65 patients in whom there was a suspicion of perforation. In 59 the bronchologist was able to substantiate the suspicion, and the perforation was found at the suspected location. In 6 patients the presence of perforation was assumed on the basis of the tomographic findings. In 2 cases the tomogram indicated the presence of a healed perforation, despite the fact that bronchoscopic findings had been interpreted as negative. Repetition of the bronchoscopic examination, suggested by the tomogram, led to bronchoscopic confirmation of the tomographic diagnosis.

Not all portions of the bronchial tree provide fruitful fields for tomographic study. The lateral contour of the right main bronchus in the region of origin of the bronchus to the upper lobe and the lateral part of the pars intermedia reveals lymph node perforations into the bronchial canal relatively frequently and the stratigrams of this area will be found to be easily interpreted.

On the left side it is possible to make a diagnosis only in the region of origin of the upper lobe bronchus

and at the point of its division into the bronchi to the lower lobe and the lingula. Perforations are best demonstrated on the lateral wall of the lower lobe bronchus and on the medial wall of the branch to the lingula; the rest of the bronchus is relatively inaccessible to tomographic demonstration because of superimposed vertebral shadows.

Success has not yet been attained in differentiating between pseudoperforations, such as shadows of mucous glands, and recent perforations, and particularly between freshly formed and recently healed perforations.

Of essential importance in the tomographic demonstration are the position of the tomographic plane (it should be parallel to the long axis of the bronchial lumen), the focal distance (it should be at least 110 cm.), and the hardness of the roentgen ray. A soft tube (3 to 5 kilovolts) should be used.

The possibility of artefact production is always present and only diagnoses should be accepted that are unequivocally positive. Despite these restrictions the authors believe the possibility of correct diagnoses is excellent and justifies further study.

—John W. Brennan, M.D.

The Use of Retroperitoneal Pneumography for the Diagnosis of Preaortic Lymphadenopathy (Possibilità radiologiche nella diagnostica delle adenopatie lomboaortiche mediante l'uso del pneumoretroperitoneo). G. Carnevali and S. Di Pietro. *Radiol. med.*, Milano, 1958, 44: 858.

The difficulty that one encounters in recognizing the existence of preaortic lymphadenopathy is discussed. Recognition is important when one is dealing with metastatic tumors of the testes, such as malignant seminomas or systemic lymphomas, all conditions in which radiation therapy may offer considerable palliation.

During the past 6 years, the authors have used retroperitoneal pneumograms in about 100 patients. Their technique consists in the injection of 1,500 to 2,000 c.c. of oxygen via a precoccygeal route. One-third of their patients with systemic lymphomas and testicular tumors were submitted to this examination without any clinical evidence of abdominal metastases. Another third of their patients with similar conditions had clinical findings suggesting abdominal lymph-node involvement. Although the authors do not give any exact data, they do state that in many of these two groups of patients, the special x-ray studies revealed the presence of preaortic lymph node metastases that were not obvious clinically.

In another third of their patients, clinical examination showed obvious midline masses. In all of these patients, the air studies showed rounded shadows situated in the midline which were either superimposed on the shadow of the psoas or going beyond the psoas margins in accordance with their size. Films were taken only in the anteroposterior projection. The oblique views were difficult to interpret because of the shadows of the prevertebral vessels. When the preaortic nodes were small, their shadows were masked by the vertebral column shadow. Tomograms are taken occasionally when the plain films are difficult to interpret.

The authors state that, in the majority of cases, tomograms are not necessary. Shadows in the regions of the pancreas and duodenal loop are particularly difficult to interpret. *—René Menguy, M.D.*

Modern Roentgenologic Diagnosis of Disease of the Large Bowel with Special Consideration of the Double Contrast Method (Ueber moderne roentgenologische Dickdarmdiagnostik unter besonderer Beruecksichtigung der Doppelkontrastmethode). Sölve Welin. *Münch. med. Wschr.*, 1958, 31: 1142.

The principle of the double contrast visualization of the large bowel (with air and contrast medium) was developed by Fischer in 1923 and later extensively used at the Mayo Clinic. It appears that the author's contribution to the technique concerns the use of a German laxative (exacton) and tannic acid in an enema substance called "clysodrast novum," which is used for thorough cleaning, and his organizational setup for the handling of large numbers of patients. The method has been used more than 8,500 times in 7,200 patients at the radiological University Clinic in Malmö, Sweden since 1953.

Polyps of the large bowel were diagnosed 1,195 times in this material, and in 15.8 per cent of those who were operated upon for polyps carcinoma was diagnosed while precancerous criteria were present in 29.7 per cent. This means that nearly one half of all polyps of the large bowel have a malignant potential. Gastrointestinal bleeding in children is most frequently due to polypoid neoplasms of this kind, and the author describes an interesting case of a 5 year old girl in whom a polyp disappeared almost completely over a period of 5 years. Such regression has never been observed in adults. If the polyps are less than 1 cm. in diameter they are observed for 3 to 6 months, and surgery is definitely indicated if they show evidence of growth. The author has the impression that puckering (dimpling) of the colon wall towards the lumen at the basis of the polyp is highly suspicious of carcinomatous infiltration even in small polyps.

—W. Dieter Bergman, M.D.

Simultaneous Cholecystography and Urography with a New Medium "Duografin." Theodore L. Orloff. *Am. J. Roentg.*, 1958, 80: 618.

The author presents a series of 25 cases examined by means of duografin, which may be used as a new roentgenographic preparation for the simultaneous visualization of the biliary and renal systems. The mixture contains 40 per cent renografin and 20 per cent cholografin, both present as the methylglucamine salt in water solution.

The technique of examination is similar to that of a combination of cholecystography and urography with the cholecystographic medium appearing approximately 15 minutes after the injection for visualization of the hepatic and common bile ducts. The gallbladder is best visualized within 2 to 2.5 hours after the injection, meanwhile visualization of the urinary tracts, which are at their optimum opacification for roentgen examination at 7 minutes after the injection, are visible. Reactions have been at a minimum, but the patients were given 50 mgm. of pyribenzamine by the oral route as a routine procedure, 30 minutes

to one hour before the examination. Intradermal skin tests are routine.

Since many patients with right upper quadrant disease frequently are in need of the procedure of cholecystography and urography, this medium will obviate the necessity of two separate injections of opacifying media and should gain favor in general roentgenographic practice.

—*Moris Horwitz, M.D.*

Critical Evaluation of Roentgen Pelvimetry; Personal Investigations (Kritische Betrachtungen zur geburtshiflichen Roentgen-Diagnostik unter Auswertung eigener Untersuchungen). H. Zeitz and D. Buttenberg. *Medizinische*, 1958, 37: 1438.

Roentgen pelvimetry plays an important part in the problem of lowering fetal and maternal mortality. This article deals critically with its indication.

1. Routine roentgen pelvimetry prenatally or during labor is rejected. There is danger of malignancy in the children.

2. There has to be strict indication for roentgen pelvimetry.

Only 174 of 7,502 women in labor, i.e., 2.3 per cent, were subjected to the Guthman type of roentgen pelvimetry. Of these 174 women, 48.8 per cent, 85 women, had to be delivered by cesarean section. Of the 7,328 women who had no roentgen pelvimetry, only 238 women, 3.2 per cent, had to be delivered by cesarean section. Of these women, 92 had misproportions or contracted pelves. Indications for section in this series were based solely on manual examinations.

The accuracy of the authors' roentgenologic pelvimetry was substantiated in 55 cases by laparotomy and cesarean section. The error was 2 mm. plus or minus.

—*Otto Weiss, M.D.*

Urologic Roentgenology: Some Clinical Applications. Reed M. Nesbit. *Am. J. Roentg.*, 1958, 80: 557.

The author, in his Hickey Lecture of 1958, presents a review of urological roentgenology, including many interesting historical side lights. The reactions to excretory urographic studies and their prevention are briefly described. The procedure of arteriography for demonstrating the arterial supply to the kidneys is discussed and the indications for this procedure are shown to be limited, particularly for the demonstration of neoplasms. The value of the procedure in the study of hypertension of renal origin is of considerable interest.

An additional procedure employing radioactive I^{131}, tagged diodrast, for determining the vascular status of the kidneys, is briefly discussed and with increasing experience this procedure should prove of great value in the study of vascular abnormalities. It is thought that this procedure would obviate the need for the more serious procedure of arteriography in all but an occasional hypertensive patient.

Retroperitoneal air studies of various types are briefly discussed, and the dangers are well presented. Their limited usefulness is also indicated.

The value of delayed cystograms and cystograms made during micturition, particularly in early childhood when ureteral reflux can be visualized on the delayed cystogram and when surgical intervention may be a life-saving procedure, is exceedingly well shown.

—*Moris Horwitz, M.D.*

Angiography of the Hand in Traumatology (L'Arteriografia della mano in traumatologia). C. Bardelli and S. Chiappa. *Chirurgia*, 1958, 13: 138.

The authors have performed brachial artery angiograms in patients with traumatic and inflammatory lesions of the wrist and hand in order to evaluate this diagnostic procedure in these circumstances. The percutaneous puncture of the brachial artery under local anesthesia is used. About 10 c.c. of dye are injected and several films in the anteroposterior projection are exposed. In some cases the dye injection was repeated after the intra-arterial administration of a vasodilator drug. No complications were found as a result of the procedure.

They present the cases of 12 patients in whom this particular examination was done. Very good information of the anatomic and pathologic condition of the vessels was always obtained, but it is stressed that the radiologic interpretation should be very cautious, especially in connection with arterial spasm which is always present in serious trauma.

Although the report is based on a small number of cases the authors believe that angiography is a valuable procedure for the final clinical evaluation of every case, to decide the surgical treatment and to achieve an accurate prognosis.

—*Ruben Brochner, M.D.*

Lymphangiography and Lymphadenography in Man (Lymphangiographie und Lymphadenographie am Menschen). F. Kaindl, E. Mannheimer, and B. Thurnher. *Fortsch. Roentgenstrahl.*, 1958, 89: 1.

The authors have studied a series of 140 lymphangiographies done with a technique previously described by Kinmoth (*Brit. J. Surg.*, 1957, 189: 1). They take pains to point out that an excess amount of contrast medium (more than 2 to 4 c.c.) can seriously distort the findings. The following main groups have been observed when disease of the lymph vessels was present:

1. Primary lymph channel changes: (a) hypoplasia of the lymph vessels with a decrease in numbers and caliber; the contrast substance is spread netlike over a large area and is possibly removed through venous pathways; (b) in lymphectasia (lymphedema congenitum, Milroy's disease) the lymph vessels are dilated, meandering, and have deficient valves.

2. Secondary lymph channel changes: (a) the postphlebitic syndrome is characterized by ectatic permeable lymph channels with loss of elasticity of the surrounding structures; (b) posttraumatic changes (e.g., after inguinal lymphadenectomy) and postradiation degeneration of lymph channels have proximal obstruction and retrograde extravasation (dermal backflow) in common; (c) after pelvic inflammations rarefaction and obstruction of lymph channels in the pelvis and distally to it can occur.

Investigation of the lymph nodes showed that they were markedly enlarged and sharply circumscribed in 9 patients with lymphatic leukemia. They also showed ringlike convolutions and distinct proximal drainage. In Hodgkin's disease it was noted that the distal

channels were markedly dilated, that the nodes lacked structural detail, and that proximal vessels were visible. In 18 cases of carcinoma and sarcoma the nodes were not filled with the contrast medium, but only outlined by a thin film in the marginal sinuses. The distal lymph channels formed funnel-shaped distentions where they entered the node, and proximal drainage could hardly ever be seen. It is possible that these findings are significant in the diagnosis of the aforementioned diseases if they are verified in a larger number of cases.

—*W. Dieter Bergman, M.D.*

Evaluation of the Radiocurability of Cervical Uterine Cancer (Valutazione della radiocurabilita del cancro della cervice uterina). GIUSEPPE PESCETTO. *Q. clin. ostet. gin.*, 1958, 13: 257.

THE AUTHOR believes that selective therapeutic criteria, tailored to the individual case, should be preferred to fixed rules in treating cervical cancer. He reviews the problems encountered with radical surgery as well as radiotherapy, and he attempts to answer two basic questions: (1) Are present tests valid in determining the degree of radiocurability of a cervical cancer? and (2) Is it possible to increase the radiosensitivity of the tumor and therefore to improve the prognosis?

An extensive and well-documented review of the literature is presented as an introduction to the author's personal observations on a substantial group of patients with cervical cancer in all stages of evolution. A large part of this review is devoted to the well known work of Glucksmann and his histologic test; to the histochemical tests with emphasis on the contributions of Gusberg, and to the work of Ruth and John Graham regarding the radiation response (RR) and the sensitization response (SR) of the vaginal cells.

The author's experience is based on 151 cases divided in 4 groups. The first group included 40 patients, with predominantly stage 3 and 4 cancer, followed up for 5 years after radiotherapy. The survival time was compared with the results of the prognostic indications obtained from the tests of Graham, Gusberg, Glucksmann, and the connective tissue test of McManus-Hotchkiss. All of the 17 patients surviving after 5 years showed a good response of the connective tissue test; 16 of them showed a good SR and RR, 13 presented a good response to the test of Gusberg, while a good response to the test of Glucksmann was observed in only 12. There seemed to be a closer correlation between SR and survival in the postmenopausal patients. A small percentage of the patients who died gave a good response in some of the tests.

In the second group of 40 patients, treated with the same method from November, 1955 to December, 1956, the author studied the influence of menopause, histologic type, and stage of evolution of the tumor on the results of the tests. The third group included 65 patients again treated with radiotherapy during 1956 and 1957. In this group, the author attempted to potentiate the response of the tumor to radiotherapy by the administration of testosterone, alphatocopherol, or prednisone. Alphatocopherol, 200 mgm. daily for 7 days, was given to 15 patients and an increase in SR was observed in 8; testosterone, 250 mgm. in a single injection, increased the SR in 22 of 25 patients; alphatocopherol and testosterone in the same dosage determined an increase in SR in all of the 20 patients treated with this combination prior to radiotherapy. No change in SR was observed in 5 patients treated with 30 mgm. of prednisone daily for 10 days. The fourth group included 6 cases of recurrent cervical cancer. The tests gave poor prognostic results in all of them.

The author is of the opinion that these methods have a definite value in the study of the individual case and although each of them has its shortcomings and seems to explore only one facet of a complex problem, the consideration of all of them is helpful, particularly in a situation where a decision for radiotherapy rather than a combined radiosurgical approach may be facilitated by the response obtained by these tests. The increase in SR and RR obtained by the administration of alphatocopherol and testosterone would suggest that this therapy increases the radiosensitivity of the tumor and could deserve further clinical applications. —*Franco F. Sangalli, M.D.*

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

The Role of Endogenous Pyrogen in the Genesis of Fever. W. BARRY WOOD, JR. *Lancet*, Lond., 1958, 2: 53.

IN 1851 IT WAS SUGGESTED that fever might be the result of the products of inflammatory lesions. The suggestions of Zimmermann were promptly investigated by others who succeeded in preparing from purulent exudates a variety of extracts which when injected intravenously produced fever. Menkin in 1943 separated from inflammatory exudates a pyrogenic euglobulin fraction which he later named pyrexin. Recent studies reveal that pyrexin has many of the properties of pyrogenic bacterial endotoxins in that it produces fever only after a relatively long latent period when injected intravenously; it causes an appreciable leucopenia after the injection; it induces a state of refractoriness, known as tolerance, when administered repeatedly; and its pyrogenic effect is much depressed when it is injected into animals previously made tolerant to other bacterial pyrogens.

In 1948 a substance with very different properties was extracted from polymorphonuclear leucocytes by Beeson. Unlike bacterial pyrogens and pyrexin, the leucocytic pyrogen was found to be relatively heat-labile; it caused a briefer febrile response, it caused little, if any, postinjection leucopenia; it was fully active in recipients tolerant to bacterial pyrogens; it did not produce tolerance when repeatedly injected; and it was, at least to some extent, species-specific in its action.

In 1953 Grant and Whalen detected in the sera of rabbits, as long as 3 hours after the injection of typhoid vaccine, a component which produced fever when injected intravenously into a second set of rabbits. Two years later Atkins and Wood showed that the transferable pyrogen detected by Grant and Whalen was quite separate from bacterial endotoxin. The newly discovered factor appeared to be endogenous and biologically indistinguishable from leucocytic pyrogen.

The author presents considerable microbiological reasoning supported by extensive experimental work in animals and man which leads him to conclude that there is now strong experimental evidence that endogenous pyrogen derived from polymorphonuclear leucocytes and inflammatory exudate plays a central role in the pathogenesis of many kinds of fever. Leucocytes in granulocytic exudates release their endogenous pyrogen into the surrounding medium while still functionally active.

He found that during the febrile phase of experimental pneumococcal peritonitis the pyrogen was present not only in the peritoneal exudate and the thoracic duct lymph, but also in the blood stream. An endogenous pyrogen indistinguishable from leucocytic pyrogen was also detected in the sera of rabbits with pyrexia as result of acute streptococcal cellulitis, tuberculin hypersensitivity, and from the intravenous injection of typhoid vaccine and of influenzal virus. He thought that this recently identified circulating factor acts directly on the thermoregulatory centers of the brain. Endogenous pyrogen differs distinctly from the bacterial pyrogens, pyrexin, and the pyrogenic polysaccharides which can be chemically extracted from normal tissues in that none of the latter appears to be the direct cause of the fever seen in extracranial bacterial infections.

Two major problems remain unsolved in elucidating the pathogenesis of fever: (1) the chemical identity of leucocytic pyrogen, and (2) the possibility that cells other than polymorphonuclear leucocytes may be able to elaborate a like, if not identical, fever-producing factor. —*Wayne F. Cameron, M.D.*

Control of Bleeding in Familial Telangiectasia. ALLEN J. RYAN. *Meriden Hosp. Bull.*, 1958.

FAMILIAL TELANGIECTASIA (Osler-Weber-Rendu syndrome) is an often unrecognized cause of gastrointestinal hemorrhage, particularly in the elderly. In its apparent form multiple rounded hemangiomas are found scattered over the surface of the body and on mucous membranes which are accessible to inspection. In the occult type of the disease, however, the lesions appear only internally, particularly in the lungs, where they may be large enough to be the cause of multiple arteriovenous aneurysms, and in the upper gastrointestinal tract. In many patients the condition is asymptomatic until middle age and for this reason, particularly when it occurs in the occult form, it is usually unsuspected as the cause of massive pulmonary or gastrointestinal hemorrhage. Also, at this time in life it may appear as a complication of the more common conditions such as ulcer or cancer. All tests of bleeding tendencies may be normal except the Rumpel-Leede test, which will be positive.

The author presents 4 patients with gastrointestinal bleeding seen on the surgical service at the Meriden (Conn.) Hospital during the past 12 years, in which he thinks that the hemorrhage was due to familial telangiectasia. In one case the family history was negative. In the second it could not be obtained, in the third there was no definite history of symptomatic occurrences in the family, and in the fourth case a history of an aunt and 2 siblings with the same condition was elicited.

Detailed case reports of the 4 patients are given. The first was an elderly white male first seen with a massive hemoptysis. During his admission the Rumpel-Leede test was found strongly positive. Roentgenograms of the chest showed findings consistent with infarction or pneumonia in the lower portion of the left upper lobe with a subsequent bronchogram showing no evidence of bronchiectasis or tumor. A "G. I." series on this admission was negative. The patient was treated conservatively and was discharged approximately 2 months later with an impression of hemoptysis of unknown cause. The patient was ad-

mitted twice during the following 14 months after alcoholic bouts and again, approximately 2 years after his initial admission, at which time he presented a history of abdominal pain for 5 days, vomiting without hematemesis, and a history of dark-colored stools. There had been no further hemoptysis since his first admission. The patient was markedly anemic again on this admission, but the bleeding, coagulation time, and clot retraction tests were normal. The Rumpel-Leede test was again strongly positive. A bone marrow aspiration was reported normal. Although the liver was not thought to be enlarged, the cephalin flocculation was 4+. The prothrombin time was 100 per cent. A subsequent barium enema showed diverticulitis of the sigmoid colon.

The patient received multiple transfusions and was discharged with a diagnosis of acute pancreatitis, probably precipitated by his drinking. The cause of bleeding and anemia was not determined. He was admitted a few months later because of weakness and anorexia. He stated that he had not been coughing blood and was not aware of any gastrointestinal bleeding. For the first time the presence of capillary angiomas was noted on the face. On this admission the stool was negative for blood, the cephalin flocculation was 3+ and the prothrombin time was 82 per cent. Shortly following admission the stool was found positive for blood and the Rumpel-Leede test again was positive. At the time of the bleeding his platelet count was 340,000 and the prothrombin time was 100 per cent. A repeat of the barium enema a few weeks later revealed extensive diverticulosis and a filling defect of the cecum. The patient was given multiple transfusions with supplemental iron therapy and was discharged approximately one month after admission after refusing operation for a suspected tumor of the cecum. He was re-admitted to the hospital approximately 4 years after his initial admission because of melena and weakness. Again the hemoglobin was found to be only 7 grams, the prothrombin time was 87 per cent, and a "G. I." series showed antral gastritis and duodenitis. During each of his previous admissions he had received vitamin C and rutin, which had apparently helped him in his bleeding tendency previously, but on this admission they were of no avail. Laparotomy was carried out and although blood could be seen through the wall of the small intestine, no bleeding point could be found in the stomach or duodenum. A diagnosis of mild cirrhosis of the liver was confirmed. The patient expired one week after surgery in cardiac failure. Postmortem examination revealed multiple capillary angiomas of the skin and mucous membranes of the entire gastrointestinal tract with hemorrhagic infarction of large areas of the mucosa of the cecum.

A second case was of an elderly white female admitted because of weakness and gross gastrointestinal hemorrhage. On physical examination many small capillary angiomas were found beneath the tongue. The hemoglobin on admission was 7 grams, but all other studies, including bleeding, coagulation, and liver function tests, were within normal range, as was a complete gastrointestinal roentgenographic examination. Sigmoidoscopy was negative. The patient was treated with blood transfusions and started on rutin and ascorbic acid. She was re-admitted some 10 months later with recurrent melena. Again she was found in marked anemia, and a 3+ cephalin flocculation test was obtained. Her prothrombin time and blood platelets were within normal limits and again the clot retraction, fibrinogen index, and Lee-White tests were normal. The patient received 1,000 c.c. of whole blood and treatment was begun with adrenochrome monosemicarpisone sodium salicylate complex, which she received intramuscularly. She was discharged on an oral dosage of the same drug and the author states that since the discharge from the hospital, she has not manifested any further bleeding tendency and has continued to take her medication.

The third patient was a 62 year old white male who was known to have been a heavy drinker in preceding years. He was admitted to the hospital because of the passage of tarry stools. At the time of his admission a history was obtained of five previous episodes of gastrointestinal hemorrhage. Laboratory tests revealed severe anemia and all liver tests were normal except for cephalin flocculation, which was 3+. Sigmoidoscopy and barium enema revealed no lesion but a gastrointestinal series showed a pyloric ulcer. A subtotal gastrectomy was carried out and the small bowel was carefully examined at surgery but no lesion found. Bright red blood was obtained from the Levine tube after operation as late as the third day when the tube was removed. The patient received daily transfusions of 500 c.c. of bank blood. All blood studies to determine the cause of his abnormal bleeding were within normal limits. The patient was started on the adrenochrome drug intramuscularly in a dosage of 2 c.c. every 2 hours. All bleeding shortly ceased and the hemoglobin was restored to normal by the time of his discharge from the hospital some 3 weeks after admission. The patient was re-admitted, however, approximately 3 weeks later with a history of hemoptysis and the passage of black and red blood per rectum. On this admission careful examination of the mouth revealed capillary angiomas beneath the tongue and a diagnosis of hereditary telangiectasia was entertained. The patient received multiple transfusions of whole blood, fibrinogen, and vitamin K, and his condition was improved by the day following his second admission. He was again placed on adrenochrome drug intramuscularly and, although he continued to pass tarry stools for the next 2 days, there was no evidence of further active bleeding. The patient was placed on adrenochrome complex by mouth and since discharge from the hospital no further episodes of bleeding have been reported.

The last case was that of a 50 year old white female with a history of repeated nose bleeds since childhood. A brother and sister also had had nose bleeds and the brother had been studied at a Veterans' hospital where a diagnosis of telangiectasia had been made. Examination of this patient revealed the presence of multiple small angiomas, particularly on the face and lips. Examination of the abdomen revealed a large tender mass on the right. Surgery was carried out with a diagnosis of appendical abscess. At the time of laparotomy a large mass was found involving the entire descending colon, which was thought to be inflammatory. A by-pass operation was carried out in

order to prepare the patient for an inevitable second procedure. During the immediate postoperative period the patient was decompressed with a long intestinal tube which provoked repeated nose bleeds. The adrenochrome complex was begun intramuscularly with a dosage of 2 c.c. every 2 hours which appeared to control the hemorrhage within 36 hours. Subsequently a barium enema was performed, which suggested chronic ulcerative colitis to be present. This was confirmed by sigmoidoscopy. The patient was started on ACTH. Six weeks later repeat sigmoidoscopy and barium enema showed healing of the ulcerative colitis. The patient continued with the adrenochrome complex by mouth and stated for the first time in her life that she could remember she had been completely free from nose bleeds.

The author concludes that the adrenochrome monosemicarpisone sodium salicylate complex is effective in controlling the hemorrhage of familial telangiectasia by decreasing capillary permeability and promoting retraction of severed capillary ends. In the treatment of hemorrhage in these patients during their acute phase he recommends the administration of 2 c.c. of the drug intramuscularly every 2 hours until the bleeding is controlled. When this has occurred and the patient is able to take medication by mouth he thinks that a dosage of 2.5 mgm. three times a day should be given for prophylaxis of further bleeding.

A difficulty of diagnosing familial telangiectasia occurs when the disease is complicated by alcoholism, pancreatitis, heart disease, peptic ulcer, diverticulitis, and ulcerative colitis. —*Wayne F. Cameron, M.D.*

DUCTLESS GLANDS

Adrenosplenic Shunt for Metastasizing Carcinoma of the Breast. A. Walser, W. Hess, A. L. Meiner, and P. Spring. *Ger. Med. M.*, 1958, 3: 240.

On the basis of the fact that the adrenal glands secrete not only corticosteroids but also sex hormones, adrenosplenic shunt operations were done as palliative treatment in 6 female patients with metastasizing carcinoma of the breast. The operation is preceded by an adrenalectomy on the right side and is combined with a bilateral ovariectomy if this has not been completed earlier. The purpose is to eliminate all estrogens by shunting the venous drainage from the remaining left adrenal gland to the liver. This provides a situation preferable to that produced by bilateral adrenalectomy because it requires no substitution treatment with cortisone and salt. In 5 of the 6 cases subjective improvement was marked and in 5 there was no objective evidence of improvement; in one patient, however, there was both objective and subjective improvement, and after 17 months the latter patient was still without symptoms and able to work.
—*W. Foster Montgomery, M.D.*

Adrenocortical Reserve in Chronically Ill Surgical Patients. C. E. Jabbour. *Am. Surgeon*, 1958, 24: 547.

The purpose of this study made at the University of Tennessee was to attempt to identify debilitated patients with limited adrenocortical reserves, and to determine the incidence of such cases.

The intravenous ACTH test was employed to measure the adrenocortical reserve. During a 24-hour control period a total eosinophil count was determined and urine was collected for 17-ketosteroid and corticoid analysis. On the following day, the patient received 1,000 c.c. of glucose or saline solution containing 20 units of ACTH over an 8 hour period. A total eosinophil count was made before and after the infusion and a 24-hour urine collection was made for the afore-mentioned tests. This was repeated a third and fourth time in some patients. The response of some of these patients to operation was also studied.

The tests were run on 5 apparently normal and 14 markedly debilitated patients to determine the incidence of relative adrenocortical insufficiency in chronically ill surgical patients.

There was no increase in the urinary excretion of 17-ketosteroids in 3 subjects studied. This was presumed to indicate diminished adrenocortical responsiveness. However, they also gave total eosinophil counts near zero in the control period, which would indicate at least some adrenocortical activity.

The author concluded that while a diminished adrenocortical response may be observed at times in chronically ill patients, they usually survive surgery without replacement therapy.
—*Stephen H. Carveth, M.D.*

Adrenalectomy for Hyperfunctioning Lesions of the Adrenal Cortex. Edwin H. Ellison and George J. Hamwi. *Arch. Surg.*, 1958, 76: 843.

Ellison and Hamwi reported 12 cases of adrenocortical hyperfunction in which operation was performed at the Ohio State University Hospital in the period from July, 1950 to August, 1957. They classified the lesions as either functioning tumors of the adrenal cortex or adrenocortical hyperfunction without tumors. Each of these two categories was then subdivided into three disease entities according to the hormone secreted in excess: (1) Cushing's syndrome, produced by excessive hydrocortisone, (2) aldosteronism, produced by excessive aldosterone, and (3) virilism, produced by excessive adrenal androgens.

The authors recommend surgical excision of functioning tumors of the adrenal cortex. The majority of the reported cases of Cushing's syndrome occurring prior to puberty was caused by tumor of the adrenal cortex with a 50 per cent incidence of cancer. Lack of knowledge regarding the etiology of Cushing's syndrome with bilateral adrenal hyperfunction without tumor is responsible for the variations in the approach to the control of this disease. Cushing's syndrome with adrenal hyperfunction is associated with excessive hydrocortisone production, and the major biologic actions of hydrocortisone are increased ability to withstand stress, anti-inflammatory action, inhibition of tissue response to antigen-antibody reactions, ability to retain sodium and water and to excrete potassium, increase in excretion of calcium and phosphorus, inhibition of protein formation, increased gluconeogenesis and fat mobilization and utilization. Excessive amounts of hydrocortisone result in Cushing's syndrome, with the following symptoms in the order of their occurrence: truncal obesity, hirsutism, hypertension, amenorrhea in females and impotence in

males, plethora with purple striae, poor wound healing or infections, weakness and backache, purpura, acne, ankle edema, headache, neurologic symptoms, glycosuria with polydipsia or polyuria, virilism, and occasionally exophthalmos. In Cushing's disease there is a marked increase in both the plasma and the urinary levels of hydrocortisone. Stimulation with corticotropin will cause little or no effect if the excessive secretion is due to tumor. If the primary disturbance is adrenal hyperplasia, there will be more than the usual threefold increase in the level of plasma hydrocortisone following a 6 hour intravenous infusion of 25 mgm. of corticotropin and an appreciable increase in urinary hydrocortisone.

In patients with congenital adrenal hyperplasia with virilism, the major abnormality is a deficit in the ability of the adrenal gland to secrete hydrocortisone. These patients are best treated medically by the administration of corticoids and the only role of surgery is the correction of congenital genital malformations. In patients with manifestations of virilism, laboratory tests are helpful in differentiating hyperplasia from tumor, but they are not absolute. In virilism due to adrenal tumor the urinary 17-ketosteroids are markedly elevated and are not suppressed by glucocorticoids. In virilism due to adrenal hyperplasia, there is a prompt and dramatic drop in the level of urinary 17-ketosteroids following the suppression of adrenocorticotropic hormone of the anterior pituitary lobe by fluorohydrocortisone. Stimulation with corticotropin does not appreciably alter the level of 17-ketosteroid excretion in cases of adrenal tumor; however, the administration of corticotropin results in a marked increase in the 17-ketosteroid excretion in hyperplasia, but little or no increase in the hydrocortisone (17-hydroxycorticosteroid) excretion, since the enzymes necessary to form hydrocortisone in the adrenal gland are absent. The authors note that hirsutism may be present in conditions other than adrenocortical hyperfunction and one should rule out disorders of the ovary.

Aldosteronism presents a clinical picture of mild to moderate hypertension, intermittent episodes of weakness, high-normal or slightly elevated serum sodium, and, particularly, depressed serum potassium. Tetany may occur. Marked edema is not usually present. Since it is generally accepted that the secretion of aldosterone is only minimally dependent upon adrenocorticotropic hormone, surgical extirpation is the only treatment to be considered. Laboratory tests for the determination of aldosteronism are not widely available, but from the clinical standpoint primary aldosteronism should be suspected when the serum potassium levels are found to be persistently lowered and no other cause for this low serum potassium can be found.

Other diagnostic studies which may reveal cortical tumors include an intravenous pyelogram, presacral carbon dioxide infiltration, and aortography. Since sudden lowering of the available corticoids by adrenalectomy may result in adrenal insufficiency during operation or early postoperatively, the patient should receive cortisone preoperatively. During the operative procedure the surgeon must be able to visualize both of the adrenal glands before deciding upon definite excisional therapy. The surgeon should also explore the ovaries in patients in whom ovarian disease may simulate cortical hyperfunction or tumor. Sites of cortical rest should be examined for apparent adrenal tissue. The only procedure which meets all of these objectives is the anterior transabdominal approach. Severe hypertension with cardiomegaly is the sole indication for total adrenalectomy since in these cases even a small residual remnant will result in the maintenance of hypertension postoperatively. When subtotal removal of the adrenal tissues is indicated, Ellison and Hamwi suggest a left total adrenalectomy combined with a 60 to 70 per cent removal of the right adrenal, which in their experience has been sufficient to control cortical hyperfunction without the need for prolonged replacement therapy. Postoperatively, adrenal insufficiency must be considered when hypotension which is out of line with blood loss occurs. Cortisone substitution therapy in the immediate postoperative period was used for patients with unilateral cortical tumors as well as for patients with total or subtotal resections for cortical hyperfunction. If a functioning unilateral cortical tumor is removed for relief of Cushing's syndrome, the contralateral adrenal cortex is probably atrophic and must be stimulated with corticotropin before cortisone substitution therapy is discontinued. The ultimate measure of the adequate response of the residual adrenal cortex is the finding of normal urinary or plasma level of hydrocortisone without corticotrophin stimulation.

Contralateral cortical atrophy is also present in approximately one of every 3 cases of virilism associated with a unilateral cortical tumor. Since primary aldosteronism resulting from a cortical tumor has no effect on the normal adrenal cortex, corticotrophin stimulation is not necessary before withdrawing cortisone.

Adrenalectomized patients must be watched closely during the first 12 months of convalescence since minor stressful situations may precipitate adrenal insufficiency.

Eight of this group of 12 patients had primary Cushing's disease, 2 had Cushing's syndrome secondary to a pituitary tumor, 1 patient had adrenal hyperfunction with aldosteronism, and 1 patient presented virilism and an adrenocortical tumor.

—*Gilbert S. Campbell, M.D.*

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Solitary Plexiform (False) Neuroma of Buccinator Area; Case report. (Text in Greek). E. Tsikoudas. *Helliniki Iatriki*, 1957, 26B: 864.

The plexiform neuromas are not true neoplasms but dysplasias of nerves of congenital origin made up of hypertrophic development of nerve fibers or their sheaths, forming plexuses. These false neoplasms should not be confused with the schwannomas originating from nerve sheath cells which are true neoplasms, or with the fibroneuromas originating from connective tissue elements of the nerve sheath. Many workers refer to them as false neuromas. There is still some confusion about the classification of the plexiform neuromas but this can be avoided if one follows the histologic characteristics. True neoplasms of nerves or their sheaths are the ones originating from the neurilemma while the plexiform neuromas derive from the fibrous tissue in between the nerve sheaths. The false neuromas differ from the true ones in the following ways: (1) False neuromas stain red with van Gieson's stain while true neuromas stain yellow. (2) They never present malignant degeneration while fibroneuromas often become sarcomatous.

The author's case was one of a 33 year old male who had had a swelling over the area of the buccinator muscle. The swelling became more prominent after exertion and it was slightly tender on palpation but discrete and hard in consistency, about the size of an olive. The tumor was resected under local anesthesia through an endo-oral incision. Pathologic examination revealed that the tumor was made up of bundles of nerve fibers lying eccentrically and parallel to each other while interlacing in other areas. There was only a minimal amount of vascular connective stroma in between these bundles. This case is the first plexiform neuroma reported in the Greek literature. There have been, however, 7 other cases of schwannomas or fibroneuromas, most of them associated with other stigmata of von Recklinghausen's disease. —*Michael G. Seremetis, M.D.*

EYE

The Human Electroretinogram. Lorrin A. Riggs. *Arch. Ophth.*, 1958, 60: 739.

The author assesses the progress that has been achieved on human electroretinograms in the past 28 years.

The eye, like the heart and the brain, can be made to yield information about its activity through the use of electrical recording techniques even though the electrodes have an external location.

The human electroretinogram can now be used to measure photopic as well as scotopic activity within the eye. It cannot be used for visual acuity or perimetry tests because the response is still a mass response. It indicates the activity of the receptor and bipolar activity of the retina. —*Earl H. Merz, M.D.*

Intraorbital Primary Osteogenic Sarcoma. (Sarcoma osteogenico intraorbitario primitivo). Jorge de Marsillac and Ataliba Macieira Bellizzi. *Rev. brasil. cirurg.*, 1958, 36: 549.

The authors emphasize the great rarity of this condition. They report a case, occurring in a man, a farmer, 56 years of age.

Thirty-four years before, trauma to the eye had occurred, which left a small milky-white nodule in the nasal canthus next to the limbus; 4 years later the eye was blind, but there was no pain. Six months before surgery the eye suddenly became hyperemic and started to bleed copiously.

The patient's general state of health was good. The right orbit was filled by a large sessile tumor, with a granulose surface and well defined borders. The tumor measured 5 cm. in width, 7 cm. in height, 4 cm. in thickness. There was abundant, fetid hemopurulent secretion. There were no regional adenopathies. The left eye was normal. The clinical aspect was that of a malignant blastoma.

A clinical examination, a roentgenogram of the thorax, of the bones of the skull, and of the orbit revealed no abnormality.

The results of the hemogram, urea, glucose, and protein determinations were within normal limits. The Wassermann reaction was negative and the urine test negative.

Exenteration of the right orbit using Azenfeld's technique was performed. The orbital walls were unaffected, but the eyeball was practically destroyed. An occlusive dressing with vaseline gauze was applied. When granulation began roentgen therapy was administered since the lesion was radium sensitive. The patient was discharged 72 hours after the operation and was doing well 17 months later.

The authors comment on the rarity of primary bone tumors of the eye and orbit; they also emphasize the slow development of these tumors.

In order to explain the appearance of bone in an ocular tumor, the authors refer to the part played by atavism, recalling that birds, reptiles, and amphibians normally possess bone formation in the sclera.

A diagnosis of primary intra-orbital osteogenic sarcoma was made. This is the only case of its kind noted in 44,600 patients at the National Cancer Service in Rio de Janeiro, Brasil.

—*Durval Prado, M.D.*

EAR

Reconstruction of the Auricle. JOHN MARQUIS CONVERSE. *Plastic & Reconstr. Surg.*, 1958, 22: 150.

PARTIAL DEFECTS of the auricle due to trauma require resection of scar tissue which causes contraction and deformities and the reposition of the remaining cartilages in their normal anatomic relationships. The loss of cartilage is corrected by using a carved cartilaginous transplant inserted beneath the skin of the postauricular area. After a 2 month interval, the cartilaginous transplant is raised from the subjacent postauricular tissues. A split thickness graft covers the defect behind the cartilaginous transplant and over the mastoid.

Subtotal absence of the ear or congenital microtia requires four main stages in construction: (1) switching the auricular remnants, (2) providing adequate skin covering, (3) removal, preparation, and implantation of the cartilaginous framework, and (4) raising the new ear framework and covering the retroauricular area with a skin graft. Additional minor operations are required for retouching. Auricular construction is usually started around the age of 5 years. Construction of an external auditory canal is important when the defect is bilateral and is a feasible procedure in patients with roentgenographic evidence of a cellular mastoid. The techniques employed in each stage are clearly illustrated. The auricular remnant is used to construct the lobe of the ear by repositioning it to an inferior posterior position. The upper third of the remnant is used to reconstruct the anterior part of the helix. A carved costal transplant is used to provide the structural contour of the ear.

—*John F. Daly, M.D.*

Reconstruction of the Auricle. JOHN MARQUIS CONVERSE. *Plastic & Reconstr. Surg.*, 1958, 22: 230.

THE AUTHOR outlines his method of constructing the auricular framework from the costal cartilage of the eighth, ninth, and tenth rib cartilages. The costal cartilage has the advantage of the natural contour which can be utilized to reproduce the characteristic auricular curvature. Techniques for forming and shaping the antihelix and helix from the costal cartilage are outlined and clearly illustrated with numerous diagrams. At a subsequent procedure the transplanted cartilaginous framework is elevated from the mastoid area and the retroauricular groove constructed by the insertion of a split-thickness skin graft applied over a dental splint mold. A number of procedures are outlined to retouch the finished ear, giving it added refinement. Three methods are outlined for increasing the prominence of the border of the helix. The author expresses his preference for the fine-calibered tubed flaps, which are obtained from the preauricular and postauricular regions. These techniques are particularly applicable to congenital anomalies, such as microtia and congenital absence of the external auricle, as well as traumatic avulsion of all or part of the auricle.

—*John F. Daly, M.D.*

Mobilization of the Stapes, Historical Aspects. JAMES A. MOORE. *N. York State J. M.*, 1958, 58: 3095.

AFTER A brief history of mobilization, the author gives an analysis of 100 cases of stapes mobilization done by varying techniques. The author divides his cases into four groups and his successful results vary from 90 per cent in the ideal cases to 30 per cent in cases of borderline suitability. Approximately 6 per cent of the patients with successful mobilizations will show regression after the first audiogram within 6 months to 2 years. In approximately 3 per cent of the cases the hearing will be made worse.

—*John F. Daly, M.D.*

Antibiotics in Acute Tonsillitis and Acute Otitis Media. JOHN FRY. *Brit. M. J.*, 1958, 2: 883.

THE ROUTINE USE of antibiotics in the treatment of common upper respiratory infections has raised the question whether this is necessary or whether it is a good pattern of practice, since these drugs can cause serious reactions in the patient. In an attempt to answer these questions, the author has studied acute tonsillitis and acute otitis media on the supposition that all of these infections do not require such specific measures. The study was conducted over a 3 year period in a general practice in South London. There were 482 attacks of acute tonsillitis affecting 405 individuals and 552 attacks of otitis media in 422 individuals. The procedure followed was to withhold penicillin unless there was a definite indication and to follow the course carefully, always prepared to use the antibiotic when it was necessary. With this routine, antibiotics were required in 25 per cent of all attacks of acute tonsillitis, 19 per cent in the nonstreptococcal group, and 30 per cent in those in whom the hemolytic streptococcus was found in the throat swabs.

In acute otitis media, antibiotics were used in 22 per cent of all attacks, in 15 per cent of those patients with a painful ear drum, and in 34 per cent of those with discharge from the ear. The results in both groups were equally good. No serious complications resulted and on follow-up, 3 months or more later, only 3 children were found to be slightly deaf with abnormal drums. However, the testing that was done was gross testing, using the whispered voice at three feet. There were no chronic discharging ears. Recurring attacks were fairly common; 65 patients had more than one attack of tonsillitis and 85 had more than one attack of acute otitis media.

The present study points up a number of interesting factors: (1) that since the advent of the antibiotics, the bacterial infections in the upper respiratory tract have become milder, (2) that the common practice of routinely prescribing penicillin in upper respiratory infections is not necessary, (3) that in only 25 per cent of the cases is the drug actually needed and of benefit to the patient. A more conservative attitude towards

prescribing antibiotics would result in fewer allergic manifestations to the antibiotics, would be more economical, and would not be harmful to the patient.

—*John F. Daly, M.D.*

Complication of Middle Ear and Mastoid Disease Despite the Antibiotics. G. DEKLE TAYLOR. *South. M. J.*, 1958, 51: 1089.

THE CHRONIC discharging ear remains a serious problem even in the antibiotic era. In his 86 cases of suppurative mastoid disease, the author reports complications in 31 per cent. The high incidence of complications is not generally appreciated. The author makes a strong plea for early surgical intervention to prevent damage to the middle ear and inner ear by a cholesteatoma. In 61 of the cases reported, a radical mastoidectomy was necessary because of the extensive disease found at operation. The author contends that earlier surgical intervention would have made it possible to preserve function in the ear. This conclusion is supported by the case reports.

—*John F. Daly, M.D.*

NOSE AND SINUSES

Rhinoplasty, Past and Present. SAMUEL FOMON, JOSEPH LUBART, JULIUS W. BELL, ALFRED SCHATTNER, and VICTOR R. SYRACUSE. *Arch. Otolar.*, Chic., 1958, 58: 426.

IT IS ADVISED that the elongated nose be shortened by rotation of the lower lateral cartilages over the upper lateral cartilages followed by excision of an appropriate wedge of the septum. The area of raw surface between the upper and lower lateral cartilages can be increased by separating vestibular skin. The upper lateral cartilages are not shortened unless they threaten to obstruct respiration.

The lobule may be remodeled by shaving or cross hatching the lower lateral cartilages and molding them into the desired shape by packing and adhesive strapping.

Postoperative broadening can be prevented by completely separating the frontal processes of the maxillae along the lateral osteotomy cuts and dislocating them medially. The extremely wide nose may require a dorsal graft for profile projection and further narrowing of the apex of the dorsum.

A harelip nose requires correction of the associated dish face deformity by use of bone grafts, repair of nasal deformity, and reconstruction of the lip.

—*W. C. Huffman, M.D.*

Experiences with the Osteoplastic Anterior Wall Approach to the Frontal Sinus. ROBERT L. GOODALE and WILLIAM W. MONTGOMERY. *Arch Otolar.*, Chic., 1958, 68: 271.

THE FRONTAL SINUS is best approached through its anterior aspect. This is accomplished by cutting through the frontal wall at all the limits of the sinus except inferiorly. At this site the bone and periosteum are turned down on a periostial flap located along the supraorbital ridge. This approach makes the entire frontal sinus easily available to inspection and instrumentation.

If examination of the sinus proves that a local lesion such as a mucocele or pyocele is present, and if the nasofrontal duct is normal or appears capable of returning to normal, the disease area is resected and the duct is left undisturbed.

If normal drainage through the nasofrontal duct is impossible, the mucous membrane and superficial surface of the bone of the sinus cavity are removed by electric burr. After this any mucous membrane in the nasofrontal duct area is pushed down into the nose to permanently close the duct. The frontal sinus is then obliterated by a fat implant taken from the abdomen.

After the sinus is either cleansed of local disease or is obliterated as indicated by the pathologic process present the osteoperiosteal flap is returned into place and the soft tissues are closed over it.

Case histories and operative procedures in 7 cases treated by the osteoplastic anterior wall approach are presented.

—*W. C. Huffman, M.D.*

MOUTH

A Modified Technique for Creating a Lower Lingual Sulcus. FRANKLIN L. ASHLEY, AMOS N. SCHWARTZ, and MORTON F. DRYDEN. *Plastic & Reconstr. Surg.*, 1958, 22: 204.

IT IS DIFFICULT to provide a stable complete denture for the atrophic mandible. In efforts to alter the condition, foreign bodies have been implanted in or on the mandible and the sulci have been deepened.

The placing of a denture in a deepened gingival sulcus is not as satisfactory either as to appearance or as to stability as is the fitting of a denture in a deepened labial sulcus.

An incision from one retromolar area to the other is made through the mandibular mucoperiosteum just posterior to the alveolar ridge. The soft tissues are elevated from the lingual surface of the mandible down to its inferior border. The mylohyoid ridges are removed with an osteotome.

The bare surfaces of the resulting deepened sulcus are covered by a split thickness skin graft .20 of an inch in thickness. The graft is held in place by a catheter fixed in the deepest aspect of the sulcus and by a petrolatum pack in the upper part. The incision is closed with interrupted sutures over the pack. The old denture is augmented by dental compound and placed in the new sulcus on the seventh day. It is used to maintain space while the new denture is being made.

—*W. C. Huffman, M.D.*

NECK

Concerning the Presence of Vascular and Paravascular Block Formations in the Region of the Capsule and Parenchyma of the Normal and Adenomatous Thyroid. (Sulla presenza di formazioni vascolari e paravascolari di blocco nell'ambito del territorio capsulare e parenchimate della tiroide normale ed adenomatosa). G. BUCCIANTE and E. ZANNELLA. *Ateneo parmense*, 1958, 29: 673.

THE AUTHORS have studied histologically the thyroid glands of 100 normal subjects and of more than 1,000 patients with various types of thyroid disease. They have been most interested in the structure of the blood vessels, both in the gland, its capsule, and the surrounding tissues. Percutaneous subclavian an-

giography was done in 40 patients. The artery was punctured with the cannula entering the skin at about the midpoint of the clavicle and being directed medially and inferiorly. Twenty cubic centimeters of 76 per cent urographin were injected in 2 to 3 seconds and a series of films made on a seriographic device. The patients were anesthetized for this procedure.

The authors found that the blood vessels of the thyroid have structures which regulate the flow of blood as do the vessels of any other organ. In goiters, the arteries are not particularly abnormal but the veins show intimal changes, especially the perithyroid veins. The microfollicular adenomas have conspicuous formations of smooth muscle adjacent to the arterioles, veins, and lymphatic sinuses both in the capsular and pericapsular regions. In only a few cases were they able to correlate the presence of these masses of smooth muscle with hypertrophic changes in the walls of the smaller vessels as have other workers.

The contraction of these smooth muscles would, according to the authors, seem to obstruct the venous and lymphatic outflow of the gland and would thus lead to interstitial swelling. Abundant intervesicular substance always seemed to co-exist with the presence of these smooth muscle formations.

According to the authors their angiographic studies confirmed these anatomical findings. Patients with diffuse colloid cystic goiter had a remarkable retardation of the venous phase of their thyroid circulation.

In patients with microfollicular goiter, the circulatory delay is particularly conspicuous and it is in these patients that the intervesicular blocking mechanisms seem to provoke the greatest degree of obstruction.

The paper is well illustrated with some particularly striking angiograms of the various phases of thyroid circulation. —*Nicholas Wetzel, M.D.*

Tumors of the Carotid Body (Tumores do corpo carotídeo). E. Lima Basto. *Arq. Pat.*, 1958, 30: 306.

Three tumors involving the carotid body are added to the 300, more or less, which have already been reported. The carotid body has been variously designated as the glomus caroticum, corpusculum retrocaroticum, and ganglion minutum. The name "chemodectoma" was introduced to conform to the more recent theories with reference to the chemoreceptive function (control of the concentration of the carbon dioxide and oxygen) of this glandlike collection of cells and of other similar collections which are scattered along the great vessels throughout the body.

The patients reported were respectively 19, 34, and 35 years of age. Two of the 3 presented no other clinical evidence of carotid tumor than the local swelling. The third exhibited some cerebral disturbance, suggesting Jacksonian epilepsy; the symptoms were ascribed to interference with the blood supply to the brain.

In all 3 patients the tumor was successfully removed. In none could a line of cleavage be found, the consequence being that in the first two operations the carotid artery was lacerated but in each instance it was successfully sutured. In the third patient the carotid bifurcation was so involved in the tumor growth that it had to be excised. The patient not only survived, but his epileptoid manifestations disappeared.

Because the character and origin of the tumor tissue are still a matter of discussion, a description of the histologic findings in each case is of interest. In the original article a series of photographic reproductions accompany the text.

In the first case sections from the small tangerine orange-sized tumor involving the region of the carotid bifurcation showed a well developed capsule and connective tissue stroma, and a parenchymal component consisting of trabeculae of pseudoepithelial cells which exhibited a syncytial tendency and a finely granular, acidophilic protoplasm. The nuclei were rich in chromatin, deeply staining, and varying in size, but without evidence of abnormal mitotic activity. The capsule was more or less infiltrated by the tumor cells. The diagnosis was tumor of the glomus caroticum with uncertainty as to the presence of a localized malignant condition.

In the second case, sections from the orange-sized tumor disclosed cords of pseudoepithelial cells with suggestion, again, of a syncytial character. The cells were granular and eosinophilic; the nuclei were small and rich in chromatin. There were no mitoses and no evidence of infiltration of the capsular tissue. The whole was supported by a delicate connective tissue stroma. The diagnosis was tumor of the glomus caroticum.

In the third case the tissue sections disclosed a typical tumor of the carotid body. The tumor mass was in part delimited by a fibrous capsule and in part presented tumor cells invading the neighboring muscles and connective tissues. Here the question of a localized malignant tumor arose. The patient, who had exhibited epileptoid symptoms and certain motor and reflex deficiencies suggesting a destructive process in the pyramidal system, died later with symptoms of intracranial hypertension. The autopsy disclosed gliomatosis of the right parietal and frontal regions. The author believes this was independent of the tumor in the neck.

The author advocates surgical intervention since irradiation is not curative. Early diagnosis permits surgical removal of the new growth before it becomes so adherent to the structures in and about the carotid bifurcation as to render arterial excision unavoidable.

—*John W. Brennan, M.D.*

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Subarachnoid Hemorrhage, 1951 to 1958; 108 Cases. J. SIROIS, G. REINHARDT, M. HÉON, and C. BÉLANGER. *Canad. M. Ass. J.*, 1958, 79: 532.

BETWEEN the years 1951 and 1958, 108 patients with spontaneous subarachnoid hemorrhage were treated by these authors. Their method of assessment and therapy is based upon absolute bedrest and bilateral carotid arteriography under general anesthesia as soon as the patient's physical condition will permit. No intracranial procedure is performed within the first 15 days following hemorrhage, except in the case of intracerebral hematoma or angioma, when craniotomy is indicated.

If only 1 aneurysm is found by angiography, unless it is on the basilar or cerebellar arteries, a Selverstone clip is applied and gradual occlusion carried out. When 2 or more aneurysms are found or if the angiograms are negative, the patients are kept at absolute rest and rarely discharged before 4 to 5 weeks. The authors considered that no surgical therapy could be offered to patients with lesions of the vertebral-basilar system. No direct surgical attack on aneurysms was carried out.

Eighty-five and one-half per cent of the patients underwent bilateral carotid angiography. Thirty-nine patients had positive findings and 48 had negative findings. In 43 per cent of the patients the pathologic lesion was defined either by arteriography or autopsy. There were 42 aneurysms, 2 angiomas, and 3 hematomas.

The authors summarize the mortality rate of subarachnoid hemorrhage from other services; their own rate was 22.3 per cent. When hospital admission occurred less than 24 hours after hemorrhage, the mortality rate was 62.5 per cent. When admission was in excess of 24 hours following the hemorrhage, the mortality rate was 10 per cent. Few other published series show a mortality rate as low as that demonstrated by these figures which the authors ascribe to their program of therapy. They consider 65.7 per cent of their patients cured, with a morbidity of 3.5 per cent (total disability), and a 12 per cent incidence of other sequelae.

Our knowledge of the cases in which the etiology is unknown needs to be improved. The authors consider that patients who die in the first 24 to 36 hours of hemorrhage should be excluded from statistics, and research should be limited to the group of patients who survive this period. —*W. Eugene Stern, M.D.*

The Orbital Brain Syndrome and Its Relation to Traumatic Surgery (Das Orbitalhirnsyndrom und seine Bedeutung fuer die Unfallchirurgie). G. KIENLE. *Chirurg*, 1958, 29: 393.

BECAUSE OF increasing traffic and greater speed of locomotion, skull injuries are constantly increasing. The orbital brain lies without any fluid protection directly on bone and therefore is easily injured by any contusion. In addition, splintering of the orbital roof often causes brain abscesses.

The orbital brain syndrome is characterized by the beginning euphoria and loss of personal pain response. These patients insist on getting out of bed and have neither a headache nor a feeling of being sick, often demanding that they be dismissed in order to return to work. The recognition of this orbital brain syndrome is especially important for the surgeon as the absence of these subjective symptoms is apt to cover up serious brain injuries. Often brain abscesses are not recognized, and life-saving surgical intervention is omitted. We are indebted to Kleist *et al.* for calling attention to the limitation of this syndrome from other brain injuries.

When pains are present, the patient pays little attention to them. This condition may be followed by a state of euphoria or of depression. The tactile sensation is changed so that a patient may even commit a criminal act and not adapt himself to his surroundings in a normal manner. He lacks a realization of his disease and the abnormal in his behavior.

A description follows of 7 characteristic patients. The following points emerge from these observations:

1. If, after a serious head injury, there are only minor complaints, an orbital brain syndrome should be suspected.
2. In such a case, careful investigation should be made of small disturbances and evidence of splintering or fracture of the orbital roof and bones around the sinuses.
3. The absence of unconsciousness does not speak against a contusion.
4. In the roentgenographic examination one should look for accumulations of air.
5. When the skull is opened, the base of the brain should be examined, if possible.
6. If an abscess is suspected, cerebral angiography should be performed.
7. If an orbital brain syndrome is suspected, an experienced neurologist should be consulted.
8. If after several weeks the patient complains of headache, nausea, and depression, the symptoms should not necessarily be attributed to a neurosis.
9. It would be a great mistake to discharge a patient with a serious brain injury who has no subjective complaints too early and allow him to return to work or discharge him from the clinic because of bad behavior.

It is necessary, therefore, to have a systematic plan for treating these baffling cases. Orbital brain concussion must be handled in the same manner as any other brain injury. In addition to injury of the brain tissue, other disorders are present. The cerebral blood vessels are no longer able to overcome the physical changes or to regulate the fluidity and exchange of electrolytes in a normal manner. With decompensated circulation, the damaged brain tissue recovers very slowly and often incompletely. The chief target of therapy, therefore, should be the cerebral circulation.

Kretschmer recommends the following standard therapy: bed rest for 4 to 8 weeks with complete physical and psychic relaxation, papaverin or eupaverin with diuretin and small doses of luminal, and rotating morning and evening arm and foot baths.

This treatment accomplishes three results: (1) relaxation and freedom from any physical or functional demand on the circulation; (2) stimulation of the circulation; (3) gradual training of the cerebral circulation. If under rest the circulation has become compensated, then it may gradually become accustomed to increased activity. A detailed description of how these three results may be obtained is included in the article.

Patients with the orbital brain syndrome must be treated constantly or at least observed while they are ambulant until the euphoric phase and the depression which follows have passed. This is especially true of patients that occupy responsible positions. If brain injuries are carefully diagnosed and treated in this manner, many of their serious sequelae may be prevented.

—*Alfred H. Noehren, M.D.*

Carotid-Cavernous Fistulas (Le fistole carotido-cavernose). V. CASSINARI and V. BERNASCONI. *Chirurgia*, 1958, 13: 101.

IN A STUDY of this type of pathologic connection between the intracranial arterial and venous system, the authors review the data obtained from the literature and their personal experience. The carotid-cavernous fistula is a rare morbid condition which they classify as traumatic and spontaneous, the former being three times more frequent than the latter, and generally the result of ruptured aneurysm of the internal carotid artery.

The symptomatology is characteristic. A bruit may be detected by the patient and/or the examiner; the bruit disappears with compression of the affected carotid artery. Progressive unilateral pulsating exophthalmos, constriction of the visual fields, diminution of visual acuity, pulsating venous congestion, exudates and hemorrhages of the ocular fundi, impairment of the extraocular movements, sensory disturbances of the first trigeminal branch, edema and congestion of the ocular and nasopharyngeal mucosa, fall of the dyastolic and increase of the systolic pressures, and tachycardia may be present. Plain roentgenograms may reveal some evidence of the fistula, in the form of decalcification or erosion of the parasellar region; fracture of the base of the cranium, an etiologic factor in the traumatic type, may also be demonstrated. Carotid angiography certifies the diagnosis by demonstrating the abnormal communication. Angiography should be bilateral in order to determine the anatomic and physiologic conditions of the intracerebral circulation, since knowledge of these conditions is very important in deciding upon the treatment and determining the prognosis.

Treatment consists of ligation of the common or internal carotid artery at the neck. The common carotid artery has been ligated in 424 cases with a 6.9 per cent mortality rate and 62 per cent good results; the internal carotid artery has been ligated in 101 cases with a 7.6 per cent mortality rate and good results in 78 per cent. The authors conclude that the ligature of the internal carotid artery at the neck is the treatment of choice, but when the clinical manifestations of the morbid entity do not subside, intracranial clipping of the internal carotid artery should be attempted in order to exclude the fistula from the circulation.

—*Ruben Brochner, M.D.*

Brain Abscess; A Study of 47 Consecutive Cases. F. W. L. KERR, R. B. KING, and J. N. MEAGHER. *J. Am. M. Ass.*, 1958, 168: 868.

THE INCIDENCE of cerebral abscess has not declined appreciatively since the advent of chemotherapy and antibiotics. Between 1945 and 1956, at the Barnes Hospital in St. Louis, the occurrence of proved intraparenchymatous abscess was slightly over 4 cases per year, making a total of 47 consecutive cases. In 10 per cent of them, nothing could be found which would indicate the primary site of infection. Twenty-six of the cases resulted from direct extension from the usual sources, while 14 were classified as hematogenic.

Organisms were identified in 27 of the group. Streptococcus was found in 15 patients, staphylococcus occurred in 5 and proteus in 5. No organism was identified in 12 patients. Three of the patients had multiple abscesses, making a total of 54 abscesses of which 48 were above the tentorium. The abscesses were multiloculated in 6 patients.

Headache was by far the most common complaint and interestingly enough fever was the next most common symptom, with a history of preadmission fever in 33 patients. The temperature on admission was normal in 16 patients. Further symptomatology is detailed.

When electroencephalography was used (18 of the supratentorial cases), correct localization was observed in 13 patients and approximate localization in 3. Ventriculography continued to be the most reliable means of localization, but its relationship to angiography was not established, since the latter procedure was not as frequently employed.

In the face of an established diagnosis, complete excision of the abscess, plus local and systemic antibiotics, has been the method favored. Of 35 patients so treated, 30 had a satisfactory recovery. Ten patients had acute cerebritis; 1 patient died. Twenty-seven patients had well encapsulated lesions; of these 8 died. Of the 8 who died, only 2 had undergone primary excision. The remaining 6 had either not been operated upon or had had other surgical procedures, such as aspiration. Of the 4 patients with bronchogenic abscess, only 1 died.

The results of therapy were correlated with the preoperative level of consciousness of the patient. Of the 12 patients who were alert immediately before surgery all survived. Of 18 patients who were drowsy or obtunded, 15 survived. Of 17 patients who were comatose or decerebrate, 7 survived. The authors conclude that deterioration in consciousness is a symptom of greatest value in timing operation and is of considerable prognostic importance.

Of the 34 patients undergoing total excision, only 1 was incapacitated. Severe neurologic deficit, however, occurred in 4 patients, and 11 more patients had mild to moderate deficit. Of the 18 patients with no neurologic residual, 16 had had primary excision.

Postoperative epilepsy was assessed. Fifty-six per cent of the survivors of this series have had one or more seizures. If seizures are going to occur, they usually do so within the first 2 years, although in 1 patient seizures developed 14 years later. Seven patients in the first decade of life survived and in none of these has epilepsy developed to date, but in all succeeding decades the incidence was approximately 50 per cent. Abscesses located in the frontal and parietal areas were associated with the highest incidence of epilepsy. There was no relationship between the development of seizures and the nature of the infective organisms.

The total mortality for the series was 29 per cent. This figure included all patients, whether hopeless or otherwise, and those who died before operation. Seven of these 14 patients had marked cerebral edema and brain stem hemorrhages at postmortem examination. Two of the patients died from status epilepticus. Of the 44 patients operated upon, 34 recovered; a mortality of 22 per cent. The advantages of primary excision are emphasized, and the authors note that the method of treatment recommended seemed to bear no relation to the development of seizures.

—*W. Eugene Stern, M.D.*

Two Years' Experience with Chemopallidectomy. H. D. Paxton and R. S. Dow. *J. Am. M. Ass.*, 1958, 168: 755.

Chemopallidectomy has been employed by the authors with certain modifications in 52 separate procedures for dyskinesias of basal ganglion origin. Forty-three have been for parkinsonism, 2 for dystonia musculorum deformans, 3 for choreiform movements, 1 for spasmodic torticollis, and 3 for congenital athetosis. The follow-up is from 3 to 22 months.

The procedure utilized was essentially that described by other workers and follows the method of Cooper. The temporal route was employed. There were various modifications in the details of technique as applied to this group of patients. The authors used general anesthesia and complete cerebrospinal fluid replacement with air by pneumoencephalography for purposes of localization.

The procedure is recommended if the patient is unable to maintain employment or requires help in feeding or dressing. The experience with patients suffering from far advanced arteriosclerosis or periarticular fibrosis and with patients older in age than 65 years has been disappointing. Far advanced impairment of vocalization and swallowing is also considered a contraindication for operation. The effect of the operation is upon the plastic rigidity and the pill-rolling tremor with reduction in the former being the more prominent salutary effect.

In patients with bilateral disease and a unilateral operation it has been noted that whereas there may be no postoperative progression of symptoms contralateral to the operation, ipsilateral progression is unabated. The bulbar components of the Parkinson syndrome were aggravated by operation but returned to the preoperative level. Flapping, pendular tremors were made worse in 2 patients. Abnormal outbursts of laughing or crying were unchanged by the procedure. Postoperatively, there was a reduction in rigidity and tremor, at times to a point approaching 100 per cent, and yet none of the patients re-established a normal synergistic pattern.

Of the 43 procedures done for parkinsonism, there were 2 deaths, 1 case of hemiplegia, and 7 total failures. The mortality for the entire series was 4 per cent, and the total failure rate was 23 per cent. One death was due to staphylococcus pneumonia and the second to overhydration and pulmonary edema. It is to be noted that 5 major fractures occurred after minimal trauma in patients who were made ambulant, having been bedfast for long intervals preoperatively.

In the over-all results, 70 per cent of the patients had 75 per cent reduction in rigidity and 48 per cent of the patients had 75 per cent or more reduction in the tremor.

In the 2 procedures done for dystonia musculorum deformans, there was nearly complete reduction of the athetoid movements. Among the 3 procedures done for lifelong nonprogressive athetoid movements, there was no improvement. The 1 patient with a spasmodic torticollis was not helped. The 3 patients operated upon for acquired choreiform movements were all benefited.

—*W. Eugene Stern, M.D.*

Transection of the Hypophysial Stalk in the Management of Metastatic Mammary Carcinoma. G. S. Dugger, J. Van Wyke, and J. F. Newsome. *Am. Surgeon*, 1958, 24: 603.

In view of experimental evidence suggesting that transection of the hypophysial stalk will produce a functional hypophysectomy, and since this operation in man has been done in only a comparatively few patients, the authors have performed 15 such operations in patients with advanced metastasis of carcinoma of the breast. Another reason for further investigating the efficacy of the hypophysial stalk section is that total hypophysectomy is a much more difficult operation and is seldom completely achieved.

The operation was performed through a right frontal osteoplastic craniotomy with a free bone plate. The approach was along the lesser wing of the sphenoid. It is important that the stalk be sectioned as low as possible. In the first few cases the stalk was clipped and coagulated, but this has been completely abandoned since the bleeding was trivial and the coagulation and clips usually tended to produce a more severe diabetes insipidus. A tantalum disc is then placed over the sella to prevent revascularization between the pituitary and the hypothalamus.

In this series of 15 cases—all with far advanced metastatic mammary carcinoma—there was only one postoperative death which was considered to be directly due to surgery. Six patients had a temporary remission, 4 received no benefit, and 4 were operated upon too recently to permit evaluation. Eleven of the 15 patients were in the postmenopausal period and the results revealed that this group does better than those in the premenopausal period. A full evaluation of symptoms after surgery is not given, but it was stated that the relief of pain "often has been dramatic." The average period of remission was about 6.5 months following surgery. It is felt that this may be less than after the total hypophysectomy, but it is obviously impossible to evaluate this operation as compared to total hypophysectomy in a series

of only 15 cases, especially when all the patients had far advanced disease. —*Jack I. Woolf, M.D*

Unilateral Compression of the Optic Nerve by a Sphenoidal Mucocele (Syndrome de compression d'un nerf optique par une mucocèle sphénoïdale latente). D. PETIT-DUTAILLIS, SCHIFF-WERTHEIMER, M. AUBRY, and J. METZGER. *Neurochirurgie*, Par., 1958, 4: 81.

THIS RARE entity is commonly confused with compression of the optic nerve due to a tumor. A correct diagnosis can be made clinically, which avoids an unnecessary craniotomy. A correct and early diagnosis is of importance as irreversible lesions of the optic nerve result from prolonged compression.

The case reported was that of a 47 year old female who complained of left retro-ocular pain, diplopia, and progressive loss of visual acuity associated with visual hallucinations. A minimal exophthalmos and anisocoria were noted. The pupillary reflex and light perception were within normal limits and the visual fields revealed a defect in the inferior nasal and temporal field. The eye grounds revealed minimal venous engorgement and slight peripapillary edema.

A detailed roentgenological interpretation is included in the original article as well as excellent reproductions of roentgenograms. The roentgenological signs in cases of mucocele are characteristic and permit differentiation from those of tumors found in this area. Sinusitis often precedes a sphenoidal mucocele and should be a clue to diagnostic interpretation.

The authors emphasize the advantage of a paranasal or transnasal approach in therapy of sphenoidal mucoceles; the exposure is adequate for evacuation of these cystic structures and extirpation of the resulting pockets. —*Karel B. Absolon, M.D.*

SPINAL CORD AND ITS COVERINGS

Acute Cervical Spinal Cord Syndrome Secondary To Cranial Injuries (Syndromes médullaires cervicaux aigus, après traumatisme cranien sans lèsions rachidiennes évidentes). B. MONTRIEUL, L. WILLEMIN-CLOG, and J. AILLOT. *Neurochirurgie*, Par., 1958, 4: 107.

SCHNEIDER (*J. Neurosurg.*, 1954, 11: 546 and 1955, 12: 95) called attention to the syndromes of acute central and anterior spinal cord injury. An indirect injury, usually a forced hyperextension of the cervical spine, was blamed as the inciting cause.

The authors describe the case of a 61 year old laborer who 2 days after an apparently minor injury, developed a flaccid paraplegia, a left brachial monoplegia, loss of deep sensation, hypesthesia to touch and pinprick at T1-T2, and respiratory difficulties. No spinal fractures or dislocations were found on x-ray examination. The hospital course was characterized by temperature elevations, somnolence, and terminal cyanosis. The only pathological finding was an almost total degeneration of the lateral and anterior portions of a single cervical segment.

The second patient, a 34 year old male, developed a traumatic posterior disc dislocation. The intervertebral spaces between C5-C6 and C6-C7 were narrowed on x-ray examination. Paraplegia and complete anesthesia of the lower extremities with absence of tendon reflexes were noted. The upper extremities, excluding the digits, could be moved and patchy antebrachial sensory loss with anesthesia of the hands was found; the sensory loss was on the thorax at the nipple level. On pathological examination free fragments were found in the epidural space, but no macroscopic evidence of traumatization was noted on the surface of the spinal cord. The extensive degenerative changes responsible for the neurological findings were localized marginal necrosis and extensive central necrosis of the cervical spinal cord.

The authors compare the clinical and pathological data of their 2 cases with those available in the literature. In general, they agree with the pathophysiological interpretations of other studies, but no explanation regarding the period of latency after injury in the first patient was made.

—*Karel B. Absolon, M.D.*

PERIPHERAL NERVES

Management of Brachial-Plexus Injuries. JOHN F. TRACEY and EARL W. BRANNON. *J. Bone Surg.*, 1958, 40-A: 1031.

IN AN ARTICLE based on a study of 16 patients admitted to Lackland Air Force Hospital, the authors present a plea for early evaluation and reconstructive surgery in instances of brachial-plexus injury. Early myelography is stressed in order to establish the irreversibility of the neurologic deficit and hence establish a plan of treatment. In those patients with positive myelographic evidence of nerve root avulsion, the authors recommend early reconstructive surgery. In 50 per cent of their patients the myelogram was diagnostic.

In patients with a negative myelogram, the authors place the lesion within the extraspinal component of the plexus and advise supportive physical therapy for 6 months before either exploring the plexus or resorting directly to reconstructive surgery. Their aim in therapy is shoulder stability, elbow flexibility, thumb apposition, and hand grasp. A combination of fusion and tendon transplants at shoulder, elbow, and wrist levels gave satisfactory results in 14 out of 16 patients; 12 men were returned to military duty.

—*Joseph Ransohoff, M.D.*

The Treatment of Closed Injuries of the Brachial Plexus (Zur Behandlung der geschlossenen Verletzungen des Plexus brachialis). C. SCHULER. *Schweiz. Med. Wschr.*, 1958, 88: 801.

CONGESTION OF street traffic has resulted in a tremendous increase of injuries of the brachial plexus, the treatment of which is still neither clearly understood nor codified, especially with regard to operative indications. The present article is based upon 100 cases treated by the author and the study of 200 additional cases collected from 3 Swiss and 2 foreign medical centers.

By and large, one-third of the cases presented with lesions localized at the level of C5 and C6 and involving the dorsal fasciculus of C7. All of the other cases, with few exceptions, presented with a total plexus palsy. One-third of all the patients were submitted

to surgery. The author reviews some diagnostic and therapeutic details which are often overlooked despite their utmost importance.

Early treatment. Immediately following the accident and during the next few days, shock, unconsciousness, and localization of the fractures make any accurate examination of the patient difficult. The early treatment is therefore limited to the provision of adequate analgesia, immobilization of the arm and shoulder, and prevention of edema which usually results in untoward disturbance of the intraneural and perineural circulation. While the shoulder and arm are immobilized, mechanotherapy of the distal joints is recommended and should be used several times a day. The value of electrotherapy is still debated, although it seems possible that faradization may help to prevent degeneration of the neural end plates. Early operative exploration of the brachial plexus is strongly rejected by the majority of workers on the basis that ultimate demarcation of the neural injuries is completed only 4 to 6 weeks after the accident.

Neuropraxis or axonotmesis? Whenever there is no restitution or only partial recuperation after about the fourth week, electrodiagnostic and electromyographic investigation will help to determine the nature and extent of the neural injuries as well as their prognosis. During the course of the second month, treatment should still be conservative (passive mobilization, galvanization). A complete neurological examination should be done weekly. In this regard the electromyogram is apt to give the best information as to the ultimate prognosis.

When is operative treatment indicated, and in which cases? Indications for operative treatment may be summarized under three headings:

1. When there are neither clinical nor electromyographic signs of reinnervation after a period of 2 or several months.
2. When the nerve injury is localized within the superior portion of the plexus (C5-C6), whether the lesion affects the plexus partially or totally.
3. Whenever it is ascertained (by clinical investigation and excitability tests) that the injury is of the postganglionic type.

Remarks concerning neurolysis and the so-called operative exploration. It should be emphasized that in many cases operative exploration has proved to be quite deceiving as far as the ultimate prognosis is concerned. Also, it has often resulted that the proper time for useful orthopedic corrective measures is missed. In accordance with Bonney, the author considers sudation, histamine, and vasodilation tests as reliable as any operative exploration. However, in cases in which surgery is performed, he believes that the most important postoperative step is the immobilization of the plexus in an adequately relaxed position for a period of 4 to 6 weeks.

The importance of posttraumatic or postoperative immobilization. Reviewing 100 histories, in a foreign center, the author noticed that in 10 per cent of the cases, plexus injuries were complicated by fractures in the area of the shoulder and thus required thorough immobilization. Eight of the 10 patients showed remarkable recovery from their palsies, whereas of the 90 remaining subjects only 9 had fair restitution. It seems therefore evident that adequate immobilization provides far better end results than untimely massages and exercises. The optimal positioning seems to be a 50 to 60 degree abduction and elevation with light external rotation, maintained by means of a thoracocervical cast prepared in such a manner as to secure a light inclination of the head toward the injured side. It has been amply demonstrated that immobilization of the shoulder in this position does not result in ankylosis, as was commonly believed. On the other hand, x-ray examination proves that with this "montage," distance between the spinal foramen and the groove of the radial nerve is shortened by at least 5 to 6 cm., which provides more than sufficient relaxation of the plexus.

Possibilities of orthopedic reparative procedures after completion of neural reinnervation. Function which has not been restored within 12 to 16 months must be considered as lost, especially when the electromyogram still shows degeneration potentials and no sign of reinnervation. At this point, time for orthopedic corrective surgery has come. A great variety of surgical procedures has been developed to improve the function of the shoulder. These procedures deal mainly with muscle transplants and various types of arthrodesis which are reviewed in detail and with illustrations.

In his conclusion, the author re-emphasizes the concept that neurophysiology and electrophysiology have been considerably developed; this has resulted in a more accurate diagnosis as to the site and extent of the lesions of the brachial plexus, as well as a more accurate prognosis. The prognosis has been considerably improved by recent advances in the field of corrective orthopedic surgery. —*C. A. Muller, M.D.*

SYMPATHETIC NERVES

The Innervation of Vessels. GEORGE A. G. MITCHELL. *J. R. Coll. Surgeons Edinburgh*, 1958, 4: 1.

THE RELATIONSHIP of the autonomic nervous system to the vascular system, the thoracic and the craniosacral outflow of vasoconstrictor and vasodilator fibers, as well as the possibility of the existence of vasodilator fibers leaving the spinal cord through the dorsal spinal roots, is discussed.

The article is well illustrated with numerous microphotographs of blood vessels and their relations to nerve fibers. Terminal networks of specialized reflexogenous zones such as are present in the depressor aortic area are demonstrated. The author points out that all nerve bundles innervating the arterial tree contain both afferent and efferent fibers and are present as well in the venous tree but in much smaller numbers. This difference in distribution is probably relative and due to the difference in size and the respective muscular coats of the vessels involved. Distal vessels tend to have more profuse innervation than proximal vessels because, according to Mitchell, their muscular coats are relatively thicker in proportion to their size. Nerve fibers are often seen near capillaries, but it is difficult to tell whether this relationship is coincidental or functional. While little is known about efferent nerve endings, terminal

networks are found in all structures innervated by the autonomic nervous system; these are formed by the anastomosing processes of the cells of Cajal. The author believes these cells are actually primitive ganglion cells.

The author's excellent summary of this lecture is as follows:

1. Vessels are supplied by the autonomic part of the nervous system and this is not an entirely peripheral efferent mechanism. It comprises both central and peripheral parts and afferent as well as efferent moieties, and it is represented at every level in the neuraxis from the cerebral cortex to the lower end of the cord.

2. The autonomic nervous system is subdivided into sympathetic and parasympathetic components which have antagonistic effects on the vessels.

3. The chief outflow of sympathetic fibers is through the thoracic and upper lumbar spinal nerves and the parasympathetic outflows are reputedly limited to certain cranial and sacral nerves, although there is inconclusive evidence that there may be a widespread outflow of vasodilator fibers through the dorsal spinal nerve roots. Unless the latter exist the vessels of the limbs and parietes are innervated by the sympathetic component only.

4. The parasympathetic preganglionic fibers relay in ganglia situated near the vessels supplied and the postganglionic fibers, which are the axons of cells in these ganglia, are relatively short and direct in their course as compared with the corresponding sympathetic fibers.

5. The sympathetic preganglionic fibers relay in the paravertebral sympathetic trunks, in intermediate ganglia, or in one or other of the great prevertebral autonomic plexuses, and the postganglionic fibers pursue a wide variety of pathways in reaching their destinations. Those for vessels near the midline pass directly to them from the nearby sympathetic trunks or prevertebral plexuses, whereas those for the more peripheral vessels join mixed cranial and spinal nerves and are distributed with them, leaving them in the form of filaments to pass to adjacent vessels at fairly regular intervals.

6. Arteries are more profusely innervated than veins and certain arteries, e.g., visceral, facial, palmar, digital, pudendal, have a relatively rich supply. A proportion of the nerve fibers accompanying vessels, however, supply other structures such as unstriated muscular and glandular cells in the viscera or the skin.

7. Vascular nerves are always delicate, usually short, contain both efferent and afferent fibers, and occasionally are associated with minute ganglia.

8. On reaching the vessel they form superimposed plexuses in the wall—a coarse, wide-meshed plexus in the outermost parts of the adventitia, a finer plexus in the junctional area between the adventitia and media, and a still finer plexus within the media. Some claim that an additional tenuous plexus exists in the zone between the media and intima.

9. There is controversy about the exact mode of termination of the efferent fibers. Some believe they end in boutons, loops, or whorls, but an ever increasing number hold that a terminal nerve network, consisting of the anastomosing processes of small nerve cells, intervenes between the postganglionic fibers and the effector cells. The exact relationship, whether syncytial or synaptic, between the postganglionic fibers and these networks, is undetermined, as is the exact nature of the junction between the terminal networks and the effector cells. It is possible that the neurohormones responsible for the mediation of nerve impulses from the postganglionic fibers to the effector cells are formed in these networks.

10. Various types of autonomic afferent endings are found in the heart and vessels, such as grape and encapsulated endings; and there are rich terminal networks in reflexogenous zones, such as the depressor aortic area and the carotid sinus, often apparently connected directly to the axons of thick myelinated fibers. This suggests there may be afferent as well as efferent terminal nerve networks.

—*Joseph Ransohoff, M.D.*

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Consideration and Comparisons Concerning the Surgical Ligation of the Internal Mammary Arteries (Considerazioni e raffronti sopra l'intervento di legatura delle arterie mammarie interne). C. ZAGNONI and P. ZILIOTTO. *Acta chir. ital.*, 1958, 14: 511.

THE MANY AND DIVERGENT OPINIONS concerning the real efficacy of surgical ligation of the internal mammary artery in coronary artery disease encouraged this study of the anatomical changes provoked by the procedure under experimental conditions.

In the first group of experiments, on 5 dogs, the authors showed that the ligation of the main branch of the internal mammary artery resulted in increased blood flow in the collaterals (pericardiophrenic arteries), but oscillometric measurements did not show a definite increase in pressure proximal to the point of ligation, although a negligible and transient rise was noted.

The arterial supply of the pericardium seems to be characterized by a rich network of vessels from the internal mammary artery, and the thoracic and abdominal aorta. It is therefore doubtful, in the opinion of the authors, that the increased flow resulting from ligation of the internal mammary artery should be manifest primarily at the level of the reflexion of the pericardium, but rather on the entire arterial network of the pericardium.

Another important aspect of the problem is the visualization of the pericardial and myocardial anastomoses. Arteriographic studies were performed by injecting an ultrafiltrate of minium in normal and pathological hearts of men and dogs. The minium injected in the internal mammary arteries produced a complete visualization of the external network of the pericardium, but did not extend directly into the coronary system. The injection of the same opaque material in the coronary arteries, while useful in visualizing the coronary arterial system, did not enter the pericardial network. These observations would suggest that the two arterial systems are independent although a few minor anastomoses, as reported by other observers, may exist.

The authors believe that from the anatomical point of view the effects of ligation of the internal mammary arteries are rather limited.

—Franco F. Sangalli, M.D.

Sclerosing Adenosis of the Female Breast (Sulla adenosi sclerosante della mammella). FRANCO CECCONI. *Arch. ital. chir.*, 1958, 83: 501.

ADENOSIS OF THE FEMALE BREAST, under various designations (adenosis of the mamma, adenomatosis, adenofibrosis, sclerosing adenosis, fibrosing adenosis, myoepithelial tumor, mammary proliferative process), has recently been separated definitively from mammary carcinoma on the one hand, and from cystic disease of the breast on the other. This diversity of nomenclature suggests that each designation has been applied to a condition which the observer considered to be a pathologic entity, but the author is of the opinion that these pathologic conditions, so well described recently by Engleby and Gershon-Cohen of Philadelphia (*Surg. Gyn. Obst.*, 1954, 99: 199), are all different phases of the same process.

The Philadelphia scholars emphasized the similarity of the varying phases to those of the normal menstrual cycle, but on the basis of their findings in 50 surgically treated cases of mammary adenosis at the Albert Einstein Medical Center they postulated four different types of development of mammary adenosis in the female. This division into types, the author thinks, is unjustified.

He believes also there is no etiologic relationship between mammary adenosis and cystic disease. Although localized areas of adenomatous tissue occur within cystic formations, they have not been encountered in any significant amount. The two conditions moreover tend to develop at different periods of life; cystic disease after the menopause, mammary adenosis chiefly in younger persons.

The most important problem is that of distinguishing the benign lesions of mammary adenosis from the malignant lesions of cancer. The lesions of mammary adenosis lack many of the characteristics of the malignant epithelial newgrowth. The cells show neither atypical mitosis or morphology nor any tendency to penetrate the basal membrane. They tend to show progression with menstruation and regression afterward, and have been reported to respond to hormone therapy. The benign condition is now so well known that confusion with malignant conditions should not occur.

—John W. Brennan, M.D.

Clinical and Experimental Considerations with Reference to 1,627 Cases of Cancer of the Breast (Considérations cliniques et expérimentales sur 1.627 cas de cancer du sein). J. LAVIGNE. *Acta chir. belg.*, 1958, 57: 215.

AMONG 1,627 CASES of cancer of the breast observed for more than 5 years at the service for pathologic surgery at the University of Liège, Belgium, one or more recurrences developed in 948 cases. Twenty-four patients in whom the recurrence took place after more than 10 years are considered separately. Thirty patients of the group were excluded from the report because of having received preoperative irradiation therapy. Of the 918 remaining subjects, 4 were lost to view before the expiration of 10 years and 55 died of intercurrent affections. Of the remaining 859 patients 177 (20.6 per cent) are living after 10 years without evidence of recurrence and 682 (79.3 per cent) have had 1 or more recurrences in the course of these 10 years.

When the material here reported was compared with that in previous reports on primary neoplasms it was found that the recurrence rate was identical. The percentage of recurrences dropped rapidly to a low

point on the graph at about the fifth postoperative year; after the seventh year of survival the percentage of recurrences became negligible.

In advanced cases of primary neoplasm recurrences were 86 per cent; in early cases the recurrence rate within the first year was only 49 per cent. The method of treatment also affected the rate of recurrence, for example, when irradiation therapy followed the radical operation. Some workers maintain that irradiation therapy augments the chance of development of a recurrence, but the author notes that anything that prolongs the period of survival also increases the chance of recurrence and metastasis.

In a study of the graphs presented in the original article it is evident, that surgery alone and surgery combined with postoperative irradiation therapy exhibited the same rhythm in the development of recurrences and metastases, in that the early high incidence of postoperative recurrences dropped rapidly toward the base line and then showed an elevation toward the end of the second year. The initial high incidence of recurrence in the early part of the first postoperative year represented continued development of the original process, which was not cured while the elevation of the second year represented the appearance of a true recurrent process. After 2 years, 75 per cent of the recurrences were already manifest, while the remaining 25 per cent were scattered rather evenly over the remaining 8 years.

The 24 patients with a survival period of more than 10 years are too few to permit definite statements correlating this group with the first 10-year group. The author thinks that if these longtime survivors develop a tumor it does not represent a true recurrence but a later activation of an original multicentric neoplastic process. —*John W. Brennan, M.D.*

Histologic and Histochemical Study of the Adrenals and Ovaries in Patients Treated for Mammary Carcinoma (Studio istologico ed istochimico dei surreni e delle ovaie in pazienti portatrici di carcinoma mammario). C. SIRTORI, F. PIZZETTI, and V. C. CATANIA. *Tumori*, 1958, 44: 263.

THE AUTHORS report their studies on 98 women with advanced breast cancer who underwent adrenalectomy; 88 also underwent ovariectomy and 56 had their adrenalectomies done in two stages. Thirteen of the patients had a bilateral ovariectomy with only a unilateral adrenalectomy. In 8 cases, bilateral ovariectomy was followed at a second stage by bilateral adrenalectomy while in 7 cases bilateral adrenalectomy was followed by bilateral ovariectomy. In 2 cases, both ovaries and adrenals were removed at the same time. In 2 cases, bilateral ovariectomy was done as a first stage, then unilateral adrenalectomy, and as a third stage, the remaining adrenal was removed. As can be seen, the authors were thus able to study the human adrenal in a variety of endocrine states and also to study the effect of the adrenal on carcinoma of the breast and vice-versa.

They found the weight of the adrenals in their patients to vary considerably (2.2 to 11 grams with an average of 4.6 grams). In the adrenals removed at the first operation (88 cases) the zona glomerulosa was normal in 45 per cent, hypertrophic in 28 per cent, and atrophic in 27 per cent. The zona fasciculata was hypertrophic in 55 per cent, normal in 35 per cent, and atrophic in 10 per cent. The zona reticularis was normal in 43 per cent, hypertrophic in 43 per cent, and atrophic in the remaining. Reticularis hypertrophy was more marked in women whose ovaries had been removed many years before.

Histochemical studies done in 30 cases showed a decrease in the phospholipids and cholesterol and a prevalence of acid over neutral fats.

In the adrenals removed at a second operation (58 cases) the zona glomerulosa was normal in 38 per cent, hypertrophic in 24 per cent, and atrophic in 37 per cent. The zona fasciculata was normal in 22 per cent, hypertrophic in 71 per cent, and atrophic in 7 per cent. The zona reticularis was normal in 47 per cent, hypertrophic in 41 per cent, and atrophic in 12 per cent. Comparing the adrenals removed in the first and second operations the authors found that atrophy of the zona glomerulosa was prevalent. Marked decrease of the lipids was noted, especially when only a short time interval had elapsed between the first and second operation. Cholesterol was always decreased. In the zona fasciculata only scanty amounts of mucopolysaccharides were found but large nuclei with foamy cytoplasm were frequently noted. Seventy-five per cent of the ovaries showed cortical hyperplasia. Adrenal metastases were found in 36 per cent of the adrenals removed and these metastases were bilateral in 22 per cent. Ovarian metastases were noted in 26 per cent of the patients with 15 per cent showing bilateral metastases. Fifty-two of the patients were benefited by endocrine surgery, 32 were not benefited, and 14 were lost to follow-up. Age made no significant difference in the results obtained. The best results were obtained by bilateral ovariectomy and the removal of one adrenal followed by removal of the other adrenal. There seemed to be some correlation between the thickness of the zona reticularis and the sex steroids.

In the patients who were benefited, increased amounts of estrogen were found in adrenal homogenates and in the urine.

The article is well illustrated.

—*Nicholas Wetzel, M.D.*

Surgical Treatment of Breast Carcinoma (Die chirurgische Behandlung des Mammakarzinoms). M. WENZL. *Klin. Med.*, Wien, 1958, 13: 296.

THE CLASSICAL PROCEDURE for breast carcinoma is the radical operation with removal of the mamma, pectoral muscles, and axillary glands. However, large numbers of clinically early cases present involvement of the supraclavicular nodes and of the internal mammary chain. Therefore, ultraradical procedures have been developed: (1) removal of the supraclavicular nodes, (2) removal of the internal mammary chain, (3) extensive skin excision and graft, and (4) routine removal of both breasts to prevent cross-metastasis.

Another possible improvement is the addition of prophylactic radiation therapy before and after surgery. To avoid diagnostic difficulties the biopsy is timed 8 to 10 days after the prophylactic preradiation when some malignant cells are still discernible. If the

biopsy is positive, preradiation is continued, this time including also the axillary, supraclavicular, infraclavicular, and retrosternal regions. Radical resection is performed between 2 to 8 weeks after completion of the radiation (skin reaction already disappeared and malignant activity not yet resumed). Within 8 weeks after surgery the postradiation is begun. Marked improvement in the end results are being reported with this technique.

Many clinics perform prophylactic oophorectomy on preclimacteric women. The value of this method has not been finally established.

Advanced inoperable tumors are being treated with therapeutic oophorectomy, followed by adrenalectomy if the previous procedure gave beneficial results. As a last resort for preclimacteric women, hypophysectomy has its place. This procedure has a 10 per cent surgical mortality rate; replacement therapy with cortisone, and pituitary and thyroid hormones is needed. The possibility of cranial nerve damage during the procedure is likely.

K. H. Bauer reports 189 cases of percutaneous implantation of radioactive gold which accomplishes gradual cessation of pituitary activity. Replacement therapy is not needed and there is no operative mortality. The palliative result is very good.

—*Gunars Medins, M.D.*

TRACHEA, LUNGS, AND PLEURA

Temporary Collapse in the Treatment of Pulmonary Tuberculosis. F. T. Roque. *Dis. Chest.*, 1958, 34: 404.

Rest is generally accepted as fundamental in the treatment of pulmonary tuberculosis. Temporary collapse measures, such as artificial pneumothorax, pneumoperitoneum, phrenic nerve paralysis, and combinations of pneumoperitoneum and phrenemphraxis, basically are attempts to secure rest by so-called "splint" or "selective collapse" of diseased lungs.

These measures have widespread use in Europe today and are reflected in the current literature, whereas in America they are generally replaced by chemotherapy and resectional surgery.

At the Fitzsimons Army Hospital the over-all management of pulmonary tuberculosis points to the importance of chemotherapy and surgical excision of residuals as the principal weapons employed to combat the disease. After adequate use of antituberculosis drugs in combinations such as streptomycin-para-aminosalicylic acid (SM-PAS), streptomycin-isoniazid (SM-INH), streptomycin-isoniazid-para-aminosalicylic acid (SM-INH-PAS), isoniazid-para-aminosalicylic acid (INH-PAS), or streptomycin-viomycin (SM-VM), usually after 6 to 8 months, rarely longer, residuals of pulmonary lesions revealed by ordinary posteroanterior roentgenograms, laminograms, and/or bronchograms are excised. The amount of diseased lung removed is usually governed by the extent of the residuals and the pulmonary reserve the patient has as shown by external and internal pulmonary function tests.

If, after the adequate use of antituberculosis drugs, cavitary lesions or caseonodose residuals which are potentially subject to relapse remain, surgical excision is the procedure of choice. Pneumoperitoneum may be used only as a last resort in far advanced cases when, after adequate and prolonged chemotherapy, surgical excision of cavities and/or serious residuals cannot be performed because of serious impairment of pulmonary function. In those rare patients in whom chemotherapy cannot be used because of severe toxicity, pneumoperitoneum may be considered.

—*Stephen A. Zieman, M.D.*

Bronchogenic Cyst Supplied by Systemic Artery from the Aorta. (Test in Greek.) G. P. Avlamis and K. E. Bonellos. *Acta chir. hellenica*, 1958, 5: 555.

The authors present a case of bronchogenic cyst of the right lung which had free communication with the bronchial tree and was supplied by an artery arising from the abdominal aorta. The patient was a 17 year old male, who was admitted to the Surgical Clinic of the Hippocrates Hospital of the University of Athens because of repeated episodes of respiratory infections associated with high fever, cough, and purulent expectoration. The onset of the first such episode was at the age of 7 years when the patient developed empyema on the right side, and was treated by closed thoracotomy. He also had a persistent cough with some expectoration and quiescent periods between attacks. The chest roentgenograms revealed a cavity with a fluid level in the posterior region of the right lung field. Bronchography failed to demonstrate bronchial communication.

During operation bleeding was encountered when the surgeon attempted to cut the pulmonary ligament. This hemorrhage was due to a good-sized artery coming from the abdominal aorta through the diaphragm. The bleeding vessel was controlled and the patient underwent lobectomy of the right lower lobe. His recovery was uneventful. Pathological examination of the specimen revealed a large cystic cavity lined by ciliated columnar epithelium in two layers. The cavity had a free communication with the bronchial tree.

The authors emphasize that the differential diagnosis is difficult in certain cases, and many diseases may simulate the clinical and x-ray picture, such as localized congenital bronchiectasis, tuberculosis, echinococcus cyst of the lung, chronic abscess of the lung, encapsulated empyema, and cystic neoplasms with thin walls. The need for careful dissection and search for a possible abnormal blood supply is stressed.

—*Michael G. Seremetis, M.D.*

Bronchial Adenoma (Die Bronchusadenome). J. Daroczy. *Zbl. Chir.*, 1958, 83: 1356.

The pathologic histology and the clinical findings of bronchial adenoma were first reported in the German literature by Geipel and Hamperl. In the English literature they were first reported by Zamora. The paucity of reports is understandable when one realizes that in a period of 10 years one may see only 4 or 5 cases on a large thoracic surgical service. Some have said that the lesions were due to pure proliferation of the bronchial mucosa, while others have attributed them to cellular arrests, embryonal, or fetal variations. The author, however, has directed his study toward their diagnosis and treatment.

It is evident that the clinical symptoms have been mistaken for many other pathologic entities. Mild chest pain, shortness of breath, cough, hemoptysis, atelectasis, and sometimes bronchiectasis can be associated with many lung and thoracic diseases. It is because of the rarity of bronchial adenoma that so many cases are treated as other disease entities before the true condition is discovered. The author states that of his patients in recent years 3 were treated over a period as long as 2 years before the true diagnosis was established.

Early in the course of the disease little roentgen-ray evidence may be present to assist in the diagnosis. Later, tumorlike shadows, atelectasis, and pulmonary infiltration in any combination may be found. It has been generally noted that in 20 per cent of the cases there is some evidence of tumor shadow.

Atelectasis has been found in 40 per cent of the cases and inflammatory changes in 25 per cent. Bronchoscopy is the prime necessity in arriving at a diagnosis. Whether the tumor is benign or malignant is difficult to determine by examination alone. The author maintains that simple biopsy is insufficient because if the tumor appears to be malignant one has no way of determining whether there has been metastasis. On the other hand, some tumors that have been biopsied and appear to be benign are really malignant, as metastatic lesions are found elsewhere. It is the author's feeling that bronchoscopy, cytologic studies, and bronchography should be performed. The definitive surgery should consist of transpleural thoracotomy and bronchotomy for thorough removal of the primary lesion and careful examination of the surrounding tissues and lymph nodes.

—*Walter L. Byers, M.D.*

Cancer of the Lung in Women (Der Lungenkrebs der Frau). P. Sträuli. *Schweiz. med. Wschr.*, 1958, 893: 88.

Among the autopsies performed in the Department of Pathology of Zurich University, cancer of the lung accounted for 4 per cent of all the deaths in the middle of this century, as opposed to 0.5 per cent at its beginning. In the period from 1901 to 1956 1,218 cases of lung cancer were observed, 1,064 in men and 154 in women. Whereas in male autopsies an impressive increase of lung cancer was observed over the past 30 years, in female autopsies an increase was observed only in the last 10 years. The differences in the histology and age distribution were studied to determine the cause of the increase of pulmonary cancer among the males. Whether the shifting organ distribution in cancer plays a role in the sex distribution of pulmonary cancer is uncertain; however, an analysis of all cancer autopsies made by the Department of Pathology may eventually lead to a solution of this problem.

In any case, an environment which delays exposure of the female sufferers seems to be a far more important etiologic factor. For practical purposes current studies are much more important than retrospective ones. For this reason it is suggested that individuals of both sexes who have left school be studied for a period of years, particularly with regard to their smoking habits.

—*Alfred H. Noehren, M.D.*

Pleural Empyema with Special Consideration of Its Etiological and Therapeutic Aspects (Das Pleuraempyem unter besonderer Berücksichtigung ätiologischer und therapeutischer Gesichtspunkte). G. Rothke and W. Kläring. *Zbl. Chir.*, 1958, 83: 1600.

In the first part of this study, a minute description of the most common causes of pleural empyema was omitted in order to emphasize the less common causes.

In the treatment of this condition, various phases, regardless of their etiology, repeat themselves, and these will be especially emphasized. Even in the time of Hippocrates, the principles of the treatment of pleural empyema were known. The chest cavity was opened through an intercostal incision and drained through metal tubes, which were gradually shortened and through which the cavity was irrigated with oil and wine.

In 1890, drainage was first accomplished through a closed system and was soon followed by resection of a rib. The introduction of sulfonamides and antibiotics permitted more conservative treatment by puncture and instillation. This treatment has many advocates, because it seems possible, in favorable cases, to prevent or dissolve the formation of fibrous tissue by the instillation of streptokinase and pancreatic enzyme. This conservative treatment, however, is not adapted to the cases in which the emptying of the thickened pleural pus is no longer possible.

The first step, then, is operative drainage, regardless of whether the drainage is by rib resection or trocar. In any case, the mediastinum must be stabilized and pyopneumothorax prevented. The drainage tube must not go over the edge of the bed, but directly downward. Occasionally, where there is retention of pus, a second operation may be indicated at a different level.

A large thick drainage tube is best for the first 8 to 10 days, after which adhesions in the upper part of the cavity have shut off the abscess cavity from the rest of the pleural cavity and there is no more danger of a pneumothorax. The tube may then be shortened and replaced by a thin, preferably a polyvinyl, tube. With the change from closed to open drainage, the chief object of the after-treatment is the expansion of the lung by means of breathing gymnastics and forced expiration against resistance. The mortality was highest in the postpneumonic empyemas and higher in the age group over 40. After the introduction of antibiotics, the mortality dropped 50 per cent.

The chief indication for this drainage treatment is the acute empyema. If this is not cured or if it is preceded by a chronic suppuration, then there is added to the control of the infection the problem of a cavity lined with fibrous tissue.

The following methods are available for the treatment of this condition:

1. Approach of the lung to the chest wall by removal or splitting of the visceral sward.

2. Approach of the chest wall to the lung by mobilization of the bony cage.

3. Plombing of the cavity with autoplastic or alloplastic material.

The first method requires modern anesthetic technique and was not possible until World War II. A combination of several methods seems best. An intra-

pleural thoracotomy is done in which the sward is incised parallel to the blood vessels, which allows the lung to expand and approach the chest wall and the sward itself to act as an autoplastic filling material. The cavity must be carefully drained and kinking of the drainage tube prevented.

This method is superior to the radical Schede plastic operation. It is less severe, there is less deformity of the chest, there is no resultant scoliosis, the ribs are regenerated, and there is complete stabilization of the chest wall. If necessary, it can be done in several stages. Various statistics show a mortality of not more than 3 per cent. The worst prognosis occurs in cases of tuberculous empyema. Follow-up examinations were made from 2 to 8 years later. Only one recurrent suppuration from a bronchial fistula was found. There was no marked scoliosis in any case, the vital capacity was normal, and the cosmetic result was very satisfactory. There were no hernias and most of the patients had returned to their regular occupation.

Délorme was the first to show that the sward was not a diseased thickened pleura, but a fibrotic formation on top of healthy pleura and therefore could be removed with impunity.

The contraindications to decortication are (1) general causes, such as age, poor risk, infectious toxic degeneration of organs with albumin in the urine, and insufficient respiratory and circulatory reserves, and (2) special causes that would prevent re-expansion of the lung. Among these are chronic deforming changes in the peripheral bronchi. Careful x-ray and bacterial examinations of the bronchial secretion obtained by bronchial suction help to make the diagnosis. The important part of the x-ray examination, therefore, is not the demonstration of a cavity but the change in the parenchyma of the lung. Active tuberculosis is a contraindication, because decortication may cause an exacerbation of the tuberculosis. Occasionally a pleuropneumectomy is required, especially in tuberculosis and in bronchial fistula.

Several cases in which decortication was done are described. Twenty-seven patients were treated in the Surgical Clinic at Halle in the years 1953 to 1956. Among these were 9 subjected to pleuropneumectomy. A table in the original article gives the important facts concerning these cases. Among the 5 nontuberculous empyemas there was no death. In 12 of the 17 living patients, the cavities had disappeared completely; 4 patients had shrinking small cavities, and 1 patient had to be reoperated upon. While the anatomic results were very good, the functional results were somewhat disappointing.

If decortication is contraindicated, the Heller jalousie-plastic procedure may still be possible. These two methods should not exclude, but rather complement, each other. —*Alfred H. Noehren, M.D.*

HEART AND PERICARDIUM

Surgery for Congenital Coronary Artery Arteriovenous Fistulas. Egbert H. Fell, Milton Weinberg, Jr., Archer S. Gordon, Benjamin M. Gasul, and Frank R. Johnson. *Arch. Surg.*, 1958, 77: 331.

Four patients, ranging from 14 months to 18 years of age, with anomalous coronary arteries communicating with the right ventricle, are briefly described. In 2 of the 4 patients the condition was correctly diagnosed prior to surgery and successful correction was completed in all cases. In each case the coronary artery arteriovenous fistula was closed and the aneurysms were excised. There was no mortality and all of the patients now have normal cardiac function and no left-to-right shunts.

—*Harold M. Unger, M.D.*

The Applicability of Angioplastic Procedures in Coronary Atherosclerosis: An Estimate Through Postmortem Injection Studies. D. Emerick Szilagyi, Richard T. McDonald, and Lloyd C. France. *Ann. Surg.*, 1958, 148: 447.

The authors, from the Department of Surgery of the Henry Ford Hospital, Detroit, Michigan, describe the findings of an inquiry made into the feasibility of applying direct surgical techniques to the correction of the occlusive process in coronary atherosclerosis. The authors reason that angioplastic procedures in the therapy of peripheral occlusive arteriopathy generally yield good results. Also, the surgical treatment of congenital and acquired heart disease has met with considerable success. Accordingly, one may assume that direct surgical operative methods ought to be applicable to the correction of the occlusive process in coronary atherosclerosis as well. In an effort to determine the operability of such cases, the authors examined roentgenologically 190 human hearts obtained at autopsy.

Although all hearts were investigated early in this study it was later limited to hearts taken from patients over 50 years of age and patients who, before death, had had clinically manifest arteriosclerotic heart disease. Unless there was autopsy confirmation of the clinical diagnosis of arteriosclerotic heart disease, the specimen was not taken into consideration.

The hearts were removed by routine autopsy technique and, as a rule, studied immediately. For the demonstration of the coronary arterial system each coronary ostium was cannulated and a contrast mixture of glycerine and barium sulfate was injected under a pressure of 120 mm. of mercury by gravity during a perfusion time of 10 minutes. By adding color to the containers of contrast mixture, the left and right coronary arterial beds were differentially stained. Radiograms were taken in two planes in a position approximating the anatomic disposition of the heart. The pathologic study consisted of the dissection and serial sectioning of the coronary arteries. Later the angiographic and pathologic findings were correlated. The following morphologic changes were looked for and recorded in the angiograms: tortuosity, calcification, stenosis, and occlusion. Since the lumen remains unobstructed, calcification of the arterial walls has not seriously interfered with luminal blood flow and with the myocardial blood supply. On the other hand marked tortuosity impairs volume flow; but, because of the large safety margin in peripheral resistance in the coronary system, the reduction is not evident clinically. For these reasons tortuosity and calcification have negligible clinical significance and therefore were not taken into consideration in as-

sessing operability. Stenosis was regarded as having clinical importance when it had caused a narrowing of the arterial lumen exceeding 70 per cent. The state of operability was judged by the following criteria: a stenotic or occlusive lesion was operable when it was located within 5 cm. of the origin of the coronary artery involved, when the luminal diameter of the artery involved was at least 2 mm., and when a satisfactory outflow tract was present. When all the occlusive lesions in the heart were operable, the case was judged to be technically curable; when at least one but not all the lesions were operable, the case was regarded as capable of palliation.

In the findings, hearts without occlusive arterial lesions comprised 40 per cent of the total number. The reason for this is the fact that, contrary to expectations, a large proportion of the cases over 50 years of age without clinical manifestations of atherosclerotic heart disease proved to be angiographically free from occlusive lesions. In the entire group 45 of the specimens were completely normal, 23 showed functionally insignificant abnormalities (tortuosity or medial calcification of the arterial wall), and the remaining 8 revealed various lesions but were free from arteriosclerotic changes. Information regarding the normal anatomic pattern of the coronary arterial system was in keeping with the findings reported by numerous earlier investigators. In terms of the convention that classifies right or left coronary predominance according to whether the posterior interventricular septum is supplied by the right main or left circumflex coronary artery respectively, 83 per cent of the specimens were of the right predominant pattern. In 7 per cent of the cases there was not only a predominant right coronary artery but the circumflex artery was small and its deficiency was made up by a prominence of the obtuse marginal branch.

Thirty-five of the 111 cases without clinical manifestations of atherosclerotic heart disease were found to have occlusive lesions of varying severity when examined roentgenologically. Ranging in age from 39 to 90 years (with a mean age of 62.6 years) these patients had single stenoses in 15 instances, multiple stenoses in 6 instances, single occlusions in 8 instances, and multiple occlusions in 6 instances. Most of the patients had single-artery involvement (23 cases) but in 10 cases two and in 2 cases three arteries were affected. The highest rate of operability was encountered in this group. In 14 cases (or 40 per cent) cure appeared to be technically possible, while in 6 more cases (17 per cent) there was a possibility of palliation. Fifteen cases (or 43 per cent) were judged inoperable, a figure that is surprisingly high when one considers that the patients here concerned were clinically quiescent.

The largest group with occlusive lesions (clinical group without angina) comprised 56 patients varying in age from 46 to 87 years (with a mean age of 66.3 years). By far the most common pathologic lesion was multiple occlusion (41 cases or 73 per cent); single occlusion and multiple stenosis were observed in 7 cases each and single stenosis in one case. The arterial involvement was predominantly multiple, three arteries having been involved in 22 and two arteries in 28 cases; single artery disease was noted in only 6 cases. The outlook for operability was much less favorable than in the previous group. Only 9 cases were regarded as technically capable of cure while 27 cases seemed to offer no possibility for direct surgical approach. In 20 cases, however, palliation by surgical means was judged to be technically possible. The "clinical group with angina" was the smallest of the groups with occlusive lesions (23 cases) but contained the most advanced pathologic changes. Practically all the lesions were of the multiple occlusion type (21 cases). There was only one case of single stenosis and one of multiple stenosis. With regard to arterial involvement, in 13 cases three arteries were affected, in 9 cases two arteries. The range of ages varied from 39 to 77 years with a mean age of 61 years. The rate of operability was low. Eight cases were assessed as inoperable and only one case was judged capable of surgical cure. In 14 cases palliation was thought to be technically possible.

The sex distribution was the expected normal (almost even, with a slight female predominance), in cases with hearts free of occlusive disease. In patients with occlusive disease the incidence of males was much higher (77 per cent). The incidence of previous myocardial infarction of the two clinical groups was significantly different: 43 per cent in the group without angina and 87 per cent in the group with angina. In the former group 34 per cent died of terminal myocardial infarction, while in the latter group 74 per cent.

The authors discuss the validity of the material as a statistical sample and conclude that, on the whole, the picture one can decipher from the autopsied heart seems to be a true enough replica of the clinical state of the heart to allow valid conclusions, interpreted with restrictions, about the features of operability. They also discussed the merits and shortcomings of the method of injection and stressed the fact that conclusions drawn from the radiograms must always be checked by careful dissection and serial section of the coronary branches, which they did. They also stressed that the criteria adopted in this study for the evaluation of the operability of the occlusive lesions are not only arbitrary but are meant to be anatomic and technical rather than clinical.

It was noted that before being clinically manifest coronary atherosclerosis must become quite diffuse, and that localized segmental lesions amenable to cure by direct surgical attack are usually asymptomatic.

The study also pointed up the need for a safe and reliable method of coronary angiography. Since exploration of the coronary arteries by palpation or dissection has serious shortcomings, and since some of the most favorable lesions cannot be diagnosed without roentgenologic demonstration, the possible benefits of angioplastic procedures will not be fully realized until such angiographic techniques are available.

The authors conclude that the role that direct surgical procedures may assume in the treatment of coronary atherosclerosis today appears to be a restricted one. As regards the applicability of the two varieties of surgical technique, i.e., grafting and endarteriectomy, the potential usefulness of the former seems to be slight and certainly much smaller than that of the latter. From the point of view of the pos-

sibility of cure, even in the limited sense of the term permissible, the outlook is quite unpromising. If, however, one narrows the scope of therapy and aims only at some degree of palliation, there may well be a justifiable place for direct surgical intervention in some cautiously selected cases.

—*Donald M. Clough, M.D.*

Ostium Primum and Atrioventricularis Communis Defects; Clinical Manifestations and Surgical Treatment. DENTON A. COOLEY and DAN G. MCNAMARA. *Progr. Cardiovascular Dis.*, 1958, 1: 89.

ATRIAL SEPTAL DEFECTS are frequently encountered, and represent the type of congenital heart abnormality most often found in young adults. Large defects of the atrial septum may cause no symptoms in childhood, while in other cases the child may be recurrently ill and severely incapacitated. Variability of the clinical picture is explained by defects which range from a mere slitlike opening of the foramen ovale to a large defect through which much blood is shunted from the left to the right side of the heart. Four types of congenital interatrial defects are recognized. The first two, valvelike foramen ovale and septum secundum defect, are located higher in the midportion of the atrial septum, not closely associated with the mitral or tricuspid valves. This report is concerned with the two "low" types, ostium primum defect and atrioventricularis communis.

An ostium primum defect is classified as an opening low in the atrial septum, just above the mitral and tricuspid valves, in which no valvular abnormality is present and the lower edge of the defect is formed by the annulus of the atrioventricular valves. Atrioventricularis communis defect includes any low atrial defect showing evidence of maldevelopment of the endocardial cushions such as a cleft in one or both atrioventricular valves, with or without ventricular septal defect. Partial and complete types of atrioventricularis communis with numerous variations may exist; ventricular septal defect is usually associated with the latter, valvular insufficiency may exist with either.

The authors review the operative techniques which have been used during the past 10 years, ranging from closed atrioseptopexy (inversion of atrial wall) to semiopen "atrial well" techniques, to open heart surgery under hypothermia or cardiopulmonary bypass. The pump-oxygenator has permitted bypass of the heart and lungs so that adequate operating time is possible for the open repair of low atrial defects.

There are oxygenators of the film type, using vertical screens, the membrane type with plastic sheets permeable to oxygen, and the bubble diffusion type in which oxygen bubbles through a column of venous blood. The authors have developed a stainless steel oxygenator of the bubble diffusion type which may be autoclaved after it is completely assembled. With this method of extracorporeal circulation, small atrial septal defects may be closed with sutures and larger ones repaired by suturing a patch of compressed ivalon sponge over the opening. The extensive defects associated with a complete atrioventricularis communis often make repair extremely difficult and less satisfactory. In this series, there have been 55 patients operated upon for septum secundum defect, 10 for ostium primum, 9 for partial atrioventricularis communis, and 9 for complete atrioventricularis communis. In these 4 categories, there has been a mortality of 5, none, 2, and 5 patients respectively.

—*Emile L. Meine, Jr., M.D.*

Corrected Transposition of the Great Vessels of the Heart. JULES A. KERNEN. *Am. Heart J.*, 1958, 56: 583.

THE AUTHOR describes the clinical and pathologic aspects of 3 cases of a congenital cardiovascular anomaly heretofore seldom diagnosed. This condition is termed "corrected transposition of the great vessels of the heart." In one of these cases the diagnosis was made clinically, and was subsequently confirmed at autopsy. The 2 other cases were diagnosed at autopsy. This condition is easily misdiagnosed, both clinically and pathologically, but recent evidence indicates that it is not nearly so rare as might be indicated in the literature. A review of the world's literature prior to 1957 reveals only 42 cases of corrected transposition, most of which were diagnosed at autopsy.

In order to understand the anatomic features of corrected transposition of the great vessels, it is essential to have in mind the anatomic features of the more common "uncorrected" transposition of the great vessels (usually referred to simply as transposition of the great vessels). In the complete form of transposition of the great vessels the aorta arises exclusively from the right ventricle, and the pulmonary artery arises from the left ventricle. The aorta arises anterior to, and in a plane very slightly to the right of, the pulmonary artery. The two vessels run parallel to each other and do not cross in the usual manner. Thus, in transposition, the anteroposterior relation of the aorta and pulmonary artery is reversed. If no other cardiac anomalies are present, this condition is incompatible with life; there are two mutually independent circulations, one carrying unoxygenated blood through the right ventricle and out into the aorta and systemic circulation, the other carrying oxygenated blood from the lungs, through the left side of the heart, and out to the lungs again. Frequently, an additional anomaly permits mixing of the greater and lesser circulations, the most frequent anomalies being patent foramen ovale, interventricular septal defect, and patent ductus arteriosus.

In corrected transposition of the great vessels the ascending aorta and pulmonary artery are related to each other in the anteroposterior plane as in transposition of these vessels; the aorta lies anterior to the pulmonary artery, and the two vessels run parallel to each other without crossing. However, the aorta arises from the ventricle on the left side and the pulmonary artery from the ventricle on the right, and the aorta arises to the left of the pulmonary artery. Thus, since the venous connections of the heart are normal, the aorta carries oxygenated blood and the pulmonary artery venous blood, and this peculiar arrangement, per se, produces no physiologic disturbance and is of no functional consequence.

However, most cases of corrected transposition of the great vessels are associated with other cardiac anomalies. In most cases, including the 3 described in this article, there is an associated localized situs

inversus of the ventricles. The left-sided ventricle, which delivers oxygenated blood to the aorta, possesses the morphologic features of a normal right ventricle, with coarse trabeculae carneae, a tricuspid atrioventricular valve, and a crista supraventricularis delimiting a conus arteriosus. The right-sided ventricle, which delivers venous blood to the pulmonary artery, has the morphologic features of a normal left ventricle, with delicate trabeculae carneae, a bicuspid atrioventricular valve, no crista supraventricularis, and no pulmonary conus. Frequently, there is also situs inversus of the coronary arteries, although both arise from the aortic valve; it is the right-sided coronary artery that divides into anterior descending and circumflex branches.

The anomalies described above are of great interest morphologically, but of little significance functionally or clinically. Other associated abnormalities are often of great significance, and are of widely assorted types. The most frequently associated anomalies are interventricular septal defect and pulmonary stenosis. The 3 cases described in this article had localized situs inversus of the ventricles and coronary arteries, and interventricular septal defects, while 2 also had patent ductus arteriosus and preductal coarctation of the aorta, and 1 had a malformed left atrioventricular valve. A short discussion of the embryologic development of this condition is included.

Clinically, there are certain features of this condition which may lead to the diagnosis. There is no significant sex difference. One of the three cases exhibited a precordial bulge. None had a palpable thrill. All had grade 2 or 3 systolic murmurs along the left sternal border; 2 of the 3 cases had a soft diastolic murmur in the same area. There are several consistent electrocardiographic features which are helpful in establishing the diagnosis. One is atrioventricular block, usually first degree; although this was not found in the 3 cases described. Routine chest roentgenograms of these 3 cases revealed generalized cardiac enlargement. In all cases pulmonary vascular markings were accentuated. Angiocardiographic studies were performed in 2 of the 3 cases. In one of the cases these studies revealed, in addition to a ventricular septal defect with a left-to-right shunt, a counterclockwise rotation of the great vessels, with an aortic arch to the left of the pulmonary artery. This finding permitted a clinical diagnosis of corrected transposition. Cardiac catheterization was performed in all 3 cases but did not contribute to the diagnosis.

Surgical intervention is indicated only for the correction of associated cardiovascular anomalies; corrected transposition itself results in no physiologic disturbance requiring correction. However, it is very helpful for the surgeon to have preoperative knowledge of the anomalous position of the great vessels and coronary arteries. In 2 of the cases described here surgery was directed to the correction of the patent ductus arteriosus and coarctation of the aorta. In the third case the interventricular septal defect was repaired surgically. Surgical experience indicates that additional anomaly of corrected transposition of the great vessels does not alter the prognosis in the surgical repair of simple interventricular septal defects.

—*Donald M. Clough, M.D.*

Aortic Aneurysms. Technique-Indications-Results (Les anévrismes de l'aorte. Technique-indications-résultats). CH. DUBOST and F. CHAUBIN. *Ann. Chir.*, 1958, 12: 933.

THE PATHOLOGIC ANATOMY of aneurysms of the subdiaphragmatic aorta is reviewed and the technique of excision and grafting (after DeBakey) is described. The authors consider only myocardial failure, azotemia, and a precarious condition as definite contraindications to excision and grafting. Age is not a contraindication. The average age of their operative patients was 60 years.

Of 16 patients, 2 underwent simple wrapping because of the state of their heart. Fourteen underwent resection, one with ivalon and one with nylon prostheses, and the others with homografts. Three patients died; one from a tear of the vena cava during operation, one from a pulmonary embolus 5 days after operation, and one from rupture of the ivalon graft 2 months after the operation.—*Jonas Brachfeld, M.D.*

Postmortem Study of the Technique of Aortic Valvulotomy in Calcific Aortic Stenosis by Quantitative Examination of Valvular Function by Perfusion. W. GERALD AUSTEN, ROBERT S. SHAW, J. GORDON SCANNELL, and W. M. THURLBECK. *J. Thorac. Surg.*, 1958, 36: 571.

OBJECTIVE EVALUATION of the degree of improvement accomplished by the various procedures (transventricular, transaortic under hypothermia, and cardiac bypass) reported for the relief of aortic stenosis is rarely available. High operative mortality, embolic phenomena, inconsistent relief of stenosis, and the production of a significant degree of aortic regurgitation have all been encountered.

This study of postmortem specimens was undertaken to determine, by objective measurements, whether significant improvement in valvular function could indeed be accomplished by surgery in acquired calcific aortic stenosis, and particularly to determine whether stenosis could be relieved adequately without the production of major degrees of aortic regurgitation.

Quantitative techniques were used to evaluate valvular function in the heart at autopsy. The apparatus used allows perfusion of a valve in either direction at a variable rate of flow and provides measurement of the pressure gradient across the valve, the rate of flow, and the temperature of the perfusate. Steady, rather than pulsatile flow was used because the resulting data were interpreted more easily in hydraulic terms. Water was used to perfuse the valves.

The degree of aortic stenosis was determined by perfusing the aortic valve from left ventricle to aorta, and plotting the observed pressure drop across the valve against the rate of flow. The more stenotic the valve, the greater the pressure drop across the valve at any particular flow.

To study aortic regurgitation the flow was reversed and the valve perfused from aorta to left ventricle. A normal aortic valve closes promptly and allows no flow with pressures up to several hundred centimeters of water. The more regurgitant the valve, the greater the flow through the valve, and the less the pressure differences across the valve at any particular rate of flow.

The hearts of 36 patients who died with aortic stenosis were studied, and then restudied after the performance of various reconstructive procedures. In 10 cases, valvulotomy was attempted by blind instrumentation through the aorta. Stenosis was adequately relieved in 6 cases and incompletely relieved in 4. Severe regurgitation resulted in four of the nine tricuspid valves and in the one bicuspid valve. The remaining five valves showed essentially no change in regurgitation. These results were consistent with the anatomic findings after instrumentation, which showed frequent injury of valve leaflets and incomplete separation of their adherence. Release of gross calcific emboli into the perfusion fluid was observed in 4 of the 10 cases.

In the remaining 26 specimens the valve was approached under direct vision through an incision in the aorta. In order to attain accurate commissurotomy, identification of the line of fusion of the cusps was necessary. The location of the original anatomic commissures at the aortic wall was first sought. At least one commissure was usually apparent, and the others sought 120 degrees away from the site. Three helpful anatomic guides used in locating these aortic attachments included the following: (1) the anatomic points of attachment are the most distal points of valve attachment to the aortic wall; (2) they are usually marked by ridges approximately 2 mm. long, running distally along the aorta and representing an extension of the valve edges; and (3) the lines of fusion of the leaflet edges are usually apparent as lumps adjacent to the aortic wall.

By means of these perfusion studies the authors have demonstrated that adequate relief of stenosis was not obtained until the commissures were incised to a point approximately 2 mm. from the aortic wall. The regurgitation measurements reveal the significant fact that when the valves were cut to 2 mm. from the aortic wall there was no resultant regurgitation, but when these incisions were extended to the aortic wall 50 per cent of the valves became regurgitant. Two millimeter fusion of the leaflet edges was found frequently in aortic valves which showed no evidence of stenosis on perfusion or by clinical history. Division of only two of the three commissures resulted in persistent moderate aortic stenosis. Division of the third commissure uniformly relieved stenosis and occasionally even decreased regurgitation.

—*Bernard C. Gerber, M.D.*

The Pathogenesis of Poststenotic Dilatation and Its Relation to Blood Vessel Surgery (Ueber die Pathogenese der poststenotischen Dilatation und ihre Bedeutung fuer Die Gefasschirurgie). W. THORBAN, G. SCHÖNBACH, and H. L'ALLEMAND. *Thoraxchirurgie*, 1958, 6: 9.

THE AUTHORS take issue with Holman who has explained poststenotic dilatation on the basis of hemodynamic factors, and have attempted to prove their contention that some other factor is responsible by experiments on dogs. Eight mongrel dogs were used in the final group for study. Earlier, on other animals, an attempt was made to reduce the aortic circumference at least 50 per cent by simple partial ligature methods, but this proved unsuccessful and ended fatally. Plexiglass prosthetic devices were used; they were 2 to 3 cm. in length and could be secured by ties around the two halves. These devices would reduce the lumen of the aorta about the same degree as had been accomplished with ligatures.

In the early stages following mechanical obstruction there was found to be marked dilatation of the aorta proximal to the stenosis. Later, the dilatation appeared distal to the obstruction.

It was noted that if the mechanical obstruction was not allowed to stay in place too long the dilatation was completely reversible. After 8 days the dilatation seemed permanent despite release of the ligature.

Microscopic sections taken of the prestenotic and poststenotic areas revealed some hypertrophy of the muscle fibers, but there was a normal arrangement of the blood supply above the obstruction. The dilated poststenotic area revealed muscular and fibrous dissociation, a reduced blood supply, and edema. It is the opinion of the authors that poststenotic dilatation is due to inadequate nutrition secondary to obstruction.

—*Walter L. Byers, M.D.*

Experimental Results with a Prosthetic Aortic Valve. BENSON B. ROE, JOHN W. OWSLEY, and PETER C. BOUDOURES. *J. Thorac. Surg.*, 1958, 36: 563.

THE IRREVERSIBLY DESTRUCTIVE nature of certain types of acquired valvular heart disease precludes the restoration of satisfactory function by ordinary surgical maneuvers. Resection of the abnormal anatomic valve and substitution of a suitable prosthetic device in its place is the apparent solution to the problems of aortic and mitral regurgitation and calcific aortic stenosis.

Such a prosthesis must comply with certain specifications if it is to be acceptable for use in human patients. To be effective, a valve should be mechanically efficient, providing minimal resistance to forward flow and effective prevention of regurgitant flow, preferably without crushing action. It should be designed to afford safe and reliable fixation but so as not to impede the function of the other valves, not to occlude the coronary ostia, and not to disturb normal fluid dynamics. The valve should be composed of a material that is nontoxic, noncarcinogenic, and one which precludes the erosion of tissues and superficial clotting. In addition, the material should be able to maintain its tensile strength indefinitely within the blood stream.

Four years of laboratory and engineering experience have led to the development of a successful valve which seems to meet most of the requirements outlined. The prosthesis is made of a monomolecular silicone and is cast under pressure in a precision die. The three cone-shaped, thin, flexible cusps of the valve retract readily and produce minimal resistance to systolic flow (5 to 10 mm. of mercury). There appears to be little turbulence, either at the edges of the prosthesis or behind the valvular cusps. When properly cast and flamed, the silicone material has a smooth, nonwettable surface which effectively prevents clotting. The flexibility and the strength of these valves seems to be unaltered after implantation. No information is yet available on the carcinogenic properties of silicone compounds.

The valve is placed in the ascending aorta above the coronary ostia by inserting the folded prosthesis into the occluded descending thoracic aorta, and is manually pushed in a retrograde direction over the aortic arch and downward into the ascending aorta; here it unfolds and the palpable valvular action begins.

In this series prosthetic aortic valves were placed in 51 dogs; there were 19 operative deaths and 16 more deaths within 14 days. Early postoperative deaths were caused by hemorrhage, formation of clots around the valve, or partial obstruction of the coronary arteries. There has been longer survival in 15 dogs.

The clinical possibilities of this device appear to be promising inasmuch as it is well tolerated, remains flexible and functioning, and prevents surface clotting. Its physiologic value in a position distal to the coronary arteries remains unsettled, however, since these results have been obtained with the anatomic valve intact about 1.5 cm. proximal to the prosthesis.

Pressure studies done after the introduction of this prosthesis indicate that the small space proximal to the new valve and distal to the anatomic valve produces a small diastolic pressure which may be sufficient to maintain coronary flow.

—*Bernard C. Gerber, M.D.*

Hypothermia for Open Heart Surgery. HENRY SWAN. *Progr. Cardiovascular. Dis.*, 1958, 1: 50.

IN RECENT YEARS, two successful methods of performing open heart surgery have been developed. Both hypothermia and cardiopulmonary bypass have limitations, and the surgeon must be familiar with both techniques, since one or the other may be preferable for specific operative problems. Hypothermia, clinically successful before the pump-oxygenator, has a degree of safety in the author's experience which bypass has not yet achieved. The following twelve precautions and limitations are considered significant in reducing the intrinsic risk of hypothermic technique to a minimum:

1. The temperature range used is 30 degrees to 32 degrees C. rectally, at the lowest, even after drift.

2. External cooling of the anesthetized patient is carried out by immersion in lukewarm water, to which ice cubes are added. Premedication consists of demerol or barbiturate and *small* doses of scopolamine. Cooling may require 20 to 25 minutes for an adult, or as little as 12 minutes for a child.

3. Throughout induction, cooling, and operation, deliberate respiratory alkalosis is maintained by hyperventilation.

4. Hyperglycemia by slow intravenous infusion of glucose is produced throughout the procedure, since this has a beneficial effect on the myocardium.

5. The first two pints of transfused blood are freshly drawn and heparinized in plastic bags. This helps avoid a bleeding diathesis. Low blood volume is avoided.

6. A bilateral sternum-splitting incision is preferred.

7. The patient is positioned so that the cardiotomy will be the most superior aspect of the heart. Air may then escape from all chambers through the incision during retreat from the heart.

8. The heart is slowed by injection of 1:4,000 neostigmine by coronary perfusion at the onset of circulatory occlusion.

9. The root of the aorta is clamped (except in aortic stenosis) to prevent coronary flow during occlusion. This procedure helps prevent air embolism and ensures a drier field.

10. Circulatory occlusion must not exceed 6 minutes. If necessary, two periods of occlusion may be used, allowing 10 to 15 minutes interim of restored circulation.

11. After operation, the patient is warmed by carefully applied diathermy.

12. Postoperative anticoagulants are given to patients who have enlargement of the pulmonary vascular bed to prevent intravascular thrombosis.

Ventricular fibrillation due specifically to the use of hypothermia is now almost nonexistent. Hypothermia is recommended for open heart operations which can be accomplished in 10 minutes of operating time under direct vision. These include the reparative surgery of: (1) pulmonary valvular stenosis; (2) pulmonary infundibular stenosis; (3) atrial septal defect, secundum; (4) atrial septal defect with pulmonary stenosis (trilogy of Fallot); (5) congenital aortic stenosis; and (6) pulmonic stenosis with aortic stenosis. The trilogy of Fallot presents special problems because of the great variety of associated lesions. Nevertheless, in the last 46 patients with this disorder to be operated upon under hypothermia, there has been no mortality. The other five conditions appear quite amenable to operation under hypothermia in the author's series of 164 cases. Of these, 14 have died, an over-all mortality rate of 8.5 per cent. The current risk rate for isolated pulmonic stenosis and atrial septal defect is less than 2 per cent. The use of hypothermia for operations on the aortic valve is being investigated. For open heart operations requiring more than 10 minutes for definitive repair, the currently more dangerous technique of cardiopulmonary bypass must be employed.

—*Emile L. Meine, Jr., M.D.*

The Application of Hypothermia in the Correction of Cardiovascular Lesions: A Study of 140 Cases. EDWARD J. JAHNKE, JR. *Dis. Chest*, 1958, 34: 413.

ALTHOUGH hypothermia can extend over a considerable range of temperature variation, this article is concerned with experimental and clinical observations made during total body cooling from 37 to 24 degrees centigrade. It is well documented that the fundamental effect of hypothermia is reduction of the rate of metabolism in all body systems. This rate of metabolic slowing is almost linear to approximately 24 degrees centigrade at which point response is less than 50 per cent of normal. Associated with this change are other physiologic alterations which are equally important. Among these might be mentioned the decreases in heart rate, stroke volume, and cardiac output which result in systemic hypotension and are accompanied by a generalized vasoconstriction. There is a rise in blood oxygen saturation which probably reflects decreased utilization and dissociation. The respiratory rate falls and may eventually cease. If not adequately supported, this can result in severe metabolic derangements. A progressive neurogenic depression is also observed

and may be responsible for some of the serious cardiac irregularities encountered in deep hypothermia.

In addition to these effects of hypothermia, many of which are of value in various surgical situations, there are also several inherent and ever present dangers, such as the onset of significant cardiac rhythm disturbances and the development of postoperative hemorrhagic tendencies.

The technique employed in hypothermia is not difficult. Preoperative medications are the same in type and dose as those prescribed in the normothermic individual. Following induction, a constant recording esophageal or rectal thermocouple is inserted. A femoral artery is catheterized and the aortic pressure measured through a strain gauge. The electrocardiogram and electroencephalogram are continuously recorded. For the information of the surgeon, the pressure-pulse contour and the electrocardiogram are always visible on a monitoring oscilloscope.

The actual cooling process is not started until the patient is in third stage anesthesia. A refrigerating fluid is circulated through a special rubber mattress placed under the patient. This mattress can surround the trunk, arms, and legs similar to a sleeping bag. Fluid containing tubes run to a temperature control unit and in this manner, it is possible to use the same equipment for both cooling and rewarming.

It is important that shivering be prevented. This is accomplished by maintaining a sufficient depth of anesthesia or by administering small doses of curare when it is first noted. Shivering will not only counteract the effect of the refrigerant but will actually cause the temperature to rise. It also increases oxygen consumption which is believed to have a detrimental effect on the hypothermia patient.

The method of cooling as employed is slower than other reported techniques. To lower the temperature from 37 to 28 degrees centigrade may require from one to three hours depending on the size of the person and the amount of left to right shunt present. The most rapid cooling occurs in the noncardiac patient or in the cardiac patient with no shunting defect. Nevertheless, the slower method definitely lowers the incidence of ventricular fibrillation.

Cooling is discontinued when the patient's temperature is approximately two or three degrees above the desired level. This amount of additional fall can be anticipated. The mattress is then allowed to fall to the sides of the operating table so that as much or as little of the patient's body as is necessary for the operative incision, can be exposed. In those patients requiring open cardiac procedures, hyperventilation is carried out for 5 minutes prior to circulatory occlusion. This procedure keeps the patient in a state of respiratory alkalosis and possibly lowers the incidence of ventricular fibrillation. During the period of circulatory arrest, ventilation is discontinued and the lungs are allowed to collapse. With restoration of blood flow, rewarming is begun and, anesthesia wise, the patient can be carried on oxygen alone.

Wound closure is delayed until the recorded blood pressure is within normal limits. This procedure is thought to be the most significant factor in preventing postoperative hemorrhage. The patient is not sent to the recovery room until spontaneous respiration is adequate and the body temperature is between 33 and 34 degrees centigrade.

During the last three years hypothermia was employed in a variety of cardiovascular conditions. These can be divided into two categories; cardiovascular procedures performed without circulatory occlusion and direct vision cardiac operations performed under complete circulatory arrest. Of the 140 patients who were operated upon under hypothermia for cardiovascular lesions, 112 had the operations performed without occlusion of the circulatory system. Of 8 operative deaths, only 3 could be directly related to the body cooling. Open cardiac procedures were performed in 28 instances with complete circulatory arrest for periods varying from 2 to 10 minutes. Of 4 operative deaths 3 were associated with hypothermia.

—*Stephen A. Zieman, M.D.*

Elective Cardiac Arrest During Total Body Perfusion; The Relationship of Elevated Intracardiac Pressures During Arrest to Subsequent Myocardial Function and Pathologic Pulmonary Changes. John Ross, Jr., Joseph W. Gilbert, Jr., Edward H. Sharp, and Andrew G. Morrow. *J. Thorac. Surg.*, 1958, 36: 534.

Cardiac failure, ventricular fibrillation, and pulmonary parenchymal changes are not uncommon in dogs following elective cardiac arrest induced during total cardiopulmonary bypass. These complications of perfusion may also occur in patients in whom these techniques are employed. Intracardiac and pulmonary hemodynamics are markedly altered in the course of such procedures. The present study was undertaken in order to define more precisely the relationship of intracardiac pressure changes during perfusion and cardiac arrest to pulmonary damage and myocardial function following arrest.

Thirty-one dogs were subjected to total cardiopulmonary bypass averaging 35 minutes. A modified Melrose pump-oxygenator was employed to provide blood flows of approximately 100 c.c. per kilogram of body weight. Throughout the perfusion and recovery periods pressures were recorded simultaneously from the right ventricle, left atrium, and femoral artery. In 24 of the animals, elective cardiac arrest was induced by the potassium citrate method for periods of from 12 to 17 minutes. During perfusion the endotracheal tubes of all animals were opened to atmospheric pressure. Lung biopsies were obtained shortly after thoracotomy and again after perfusion.

In 7 dogs undergoing perfusion without cardiac arrest or cardiotomy, the mean left atrial and right ventricular pressures remained stable and low during perfusion. There was an average left atrial pressure increase of 2 mm. of mercury. There were no instances of ventricular fibrillation or postperfusion cardiac failure. In those 7 dogs in which right atriotomy was performed immediately prior to cardiac arrest no significant pressure elevations were observed in either the right ventricle or left atrium during the period of arrest. In 3 of the 7 dogs, ventricular fibrillation occurred when coronary flow was restored. One animal exhibited persistent heart failure after defibrillation and subsequently died. The left mean atrial pressure of this animal was elevated to over 20 mm.

Hg. In 4 animals arrest was induced, but atriotomy was not performed. Gradual elevations in mean left atrial pressure to an average value of 16 mm. Hg occurred during the period of arrest. Right ventricular pressure curves followed closely those of the left atrium. When coronary flow into the unopened heart was resumed, both pressures showed further striking elevations and the heart became grossly distended in every instance. Ventricular fibrillation occurred in 2 animals, both of which died from heart failure following electrical defibrillation. Right atriotomy was performed in 6 dogs immediately prior to restoring coronary flow into the arrested heart. Prior to atriotomy, the left atrial and right ventricular pressures during arrest increased to an average value of 16 mm. Hg. Pressures in both sides of the heart usually returned to normal coincident with right atriotomy. Ventricular fibrillation occurred in one animal and progressive heart failure followed defibrillation. Of the remaining 5 dogs, 3 developed hemodynamic evidence of persistent cardiac decompensation following perfusion. In order to localize the origin of the blood accumulating in the right heart during arrest the pulmonary artery was clamped coincident with aortic occlusion in 7 animals. A separation of the left atrial and right ventricular pressure curves occurred. The elevations in right ventricular pressures were less than in the previous group, the average rise being 9 mm. Hg. The mean left atrial pressures, however, rose strikingly to an average value of 23 mm. Hg. These findings indicated that the major source of blood filling the right heart during arrest was retrograde flow from the pulmonary artery through a collapsed and incompetent pulmonic valve.

During total cardiopulmonary bypass, the bronchial arteries provide a continuous flow of arterialized blood to the lungs. Experiments have shown that when pulmonary artery pressure is low, blood from the bronchial arteries may flow into both the pulmonary arteries and veins. Thus, during cardiac arrest when pulmonary artery pressure is low, both the right and left sides of the heart receive this flow. The experiments described in this paper demonstrate a simultaneous rise in both right and left heart pressures during a period of arrest without cardiotomy. As long as the pulmonic valve remains incompetent, the two sides of the heart are in free communication through the pulmonary vascular bed. Retrograde flow into the right heart will thus prevent elevation of left atrial pressure if right atriotomy is performed early in arrest. If intracardiac pressures are allowed to rise during arrest, a subsequent right atriotomy will usually decompress the left heart; nevertheless, myocardial failure often occurs, indicating that even temporary dilatation diminishes the likelihood of re-establishing an effective beat. Following dilatation, recovery after electrical defibrillation is also less likely. This inadequate myocardial recovery is attributed to the change in diastolic fiber length imposed by dilatation of the heart during the arrest period.

The present study demonstrates that a continuous right atriotomy during arrest will prevent intracardiac pressure elevations during cardiac arrest in the normal dog. In the face of high intrapulmonary pressures the pulmonic valve may remain competent. In this situation, left heart decompression must be maintained either by a catheter placed through the pulmonic valve, or by direct left sided cardiotomy. The practice of occluding the pulmonary artery and aorta together at the time of arrest prevents left heart decompression through the pulmonic valve, and also necessitates drainage of the left side of the heart.

—Bernard C. Gerber, M.D.

Endocardial Fibroelastosis; A Summary of the Literature and a Review of 24 New Cases. WILLIAM F. MCCORMICK. *South. M. J.*, 1958, 51: 1232.

THE AUTHOR reviews the studies made at the Institute of Pathology, University of Tennessee and the City of Memphis Hospital, Memphis, Tennessee on endocardial fibroelastosis. This disease may be defined as either diffuse or focal thickening of the mural endocardium, consisting of predominantly fibrous and elastic tissue. In the diffuse form the entire mural endocardium of one or more chambers of the heart is involved. One of the common synonyms is fetal endocarditis.

The clinical picture of this malady is usually exact enough to permit an antemortem diagnosis. It is divided into infantile, childhood, and adult types and can be called fulminating, acute, or chronic. The fulminating cases occur in about one-quarter of the total number. The symptoms usually appear at about the age of 6 weeks and consist of the sudden onset of dyspnea and cyanosis leading to death. The acute group of cases comprises about half of the total number and these are characterized by the occurrence of dyspnea, cyanosis, and tachypnea coming on between the ages of 6 weeks and 6 months, and terminating in death in a matter of weeks. The chronic cases develop slowly after 6 months of age and terminate in death only months or years later.

The usual signs and symptoms of endocardial fibroelastosis are dyspnea, cyanosis, spasmodic coughing, anorexia, failure of growth, irritability, and orthopnea. Cardiomegaly detected clinically and vomiting plus murmurs are much less common.

Roentgenograms reveal an enlargement of the heart and this is usually globular. There are no electrocardiographic findings of note.

In pathologic studies the gross appearance of the involved hearts is remarkably uniform. Cardiomegaly is a constant feature with the left ventricle being almost universally involved. The heart valves are affected in approximately one-half of the cases. Many of the cases have associated congenital abnormalities. The involved endocardium is diffusely thickened, often being as much as ten times as thick as normal. Mural thrombi are present in a relatively small proportion of the infantile cases, but in many of the older or chronic cases. There are two major types of valvular involvement, a localized and a diffuse type. On gross examination, the myocardium is usually hypertrophied. Microscopically, the most striking feature is the great overgrowth of collagenous and elastic tissue components of the endocardium. Sometimes the myocardial changes are confined to the papillary muscles.

The race and sex incidence is not important. The majority of cases occur in the first two years of life.

The etiology of endocardial fibroelastosis is not known. Numerous theories have been advanced including intrauterine infection, myocarditis, and metabolic changes. Johnson stressed anoxia as the underlying cause. This, he thought, was due to premature closure of the foramen ovale.

The clinical material studied by the authors was gleaned from more than 11,000 autopsies and a total of 24 cases was available. Fifteen of these were so-called primary endocardial fibroelastosis in which there was no associated cardiac abnormality, and there were 9 in which associated abnormalities were present. Of the cases of primary elastosis there were 9 males and 6 females. The ages ranged from less than one day to 3 years with the average age about 10 months. There were 3 fulminating cases, 7 acute cases, and 5 chronic cases. The frequency of cyanosis was apparent; it occurred in 7 of the 15 cases. The valves were not involved in 11 cases and were moderately involved in 2. All 15 of these cases showed involvement of the left ventricle, 8 without involvement of any other chamber. The authors believe that it is quite plain that primary endocardial fibroelastosis is a relatively uncommon condition, having been found in only 15 autopsy cases in an autopsy series of over 11,000.

There were 9 cases of "secondary" endocardial fibroelastosis and these occurred in association with such congenital cardiovascular defects as interventricular septal defect, patent ductus arteriosus, patent foramen ovale, and infantile coarctation of the aorta. There were 4 males and 5 females, the average age was 14 months with extremes of 4 hours to 6 years, and this represents a somewhat older average age and a wider range than occurred in the cases with primary endocardial fibroelastosis. Murmurs, usually systolic in time, were common in this group, and occurred in 7 of the 9 cases. This contrasted sharply with the primary group in which no murmurs were heard. A somewhat surprising finding in these cases was the low frequency of cyanosis. In 7 cases there was no valvular involvement. The left ventricle was involved by fibroelastosis in 7 of the 9 cases.

The article is complete with detailed tables and a long bibliography. —*Peter Dineen, M.D.*

ESOPHAGUS AND MEDIASTINUM

Experimental Replacement of Esophageal Thoracic Defects (Experimentelle Wiederherstellung von thorakalen Oesophagusdefekten). M. WENZL and W. LORBEK. *Thoraxchirurgie*, 1958, 6: 1.

THE OPERATIVE TECHNIQUE of esophageal resection and bridging of the thoracic defect with prosthetic material is discussed.

The morbidity and mortality due to displacement of the stomach into the thorax prompted the authors to search for other methods of bridging the defect without the necessity of dislocating the stomach. Their criterion for acceptable prosthetic material required that it be elastic, slowly absorbable in order that erosion cannot occur, and, finally, that it would maintain suture material long enough so that the transplant could not become dissociated before the healing process was completed.

A series of 10 mongrel dogs were subjected to thoracotomy and resection of various segments of the esophagus in the upper, middle, and lower thirds. Many types of material had previously been tested and numerous methods of suture were tried. The most satisfactory results were obtained with the use of a polystan-polyethylene material made in Copenhagen. The most functionally effective bridge appeared to be the largest sized tube compatible with the diameter of the esophagus. The prosthetic tubing was immersed in a solution of fibrin while the anastomotic site was being prepared. The mucosa was dissected free from the muscularis at either end to leave a cuff 1 to 2 centimeters in length. The mucosal section was folded inside the prosthesis while the muscular coat was pulled down over the tube. Mattress sutures through all of the layers were used to secure the graft to the recipient structure.

Sacrifice of the animals at various periods varying from 6 days to 4 months revealed grossly and microscopically that there was a bridging of normal-appearing mucosa with active repair on the outer surface of the prosthesis. In addition, there was good evidence after 3 months that the bridge was viable and there was active absorption of the bridging material. —*Walter L. Byers, M.D.*

Contribution to the Symptomatology and Therapy of Idiopathic Cardiospasm (Ein Beitrag zur Klinik und Therapie des idiopathischen Kardiospasmus). HERMANN IMDAHL. *Langenbecks Arch. klin. Chir.*, 1958, 288: 554.

AT THE SURGICAL DEPARTMENT of the University of Bonn during the last 13 years 2.5 times as many patients with achalasia were treated as during the 21 years preceding the second World War. This statistic demonstrates the role of mental-autonomic factors in the pathogenesis of this condition. In the author's material both sexes were affected with equal frequency, and mostly in the third and fourth decades of life.

Three clinical pictures may be differentiated.

In the first group the onset of cardiospasm is characterized not by dysphagia but by retrosternal pain, radiating toward the dorsum, shoulders, teeth, or upper arms. The patient complains not of pressure sensation but of cramps which are independent of meals. Dysphagia makes its appearance a few weeks or even months later. Regurgitation promptly follows ingestion of food and causes considerable loss of weight. This type was found in 18 per cent of the author's material, predominantly in women. The results of treatment with Starck's dilators were very good.

In the second group, encountered in 32 per cent of the author's material, a sudden onset of obstruction was recorded. Pain was absent but a sensation of pressure at the level of the sternum was occasionally noticed by the patients. Mild dyspnea, frequently present in the early stages of the disease, usually subsided in the course of time. Regurgitation usually took place many hours after the meal, unless artificially provoked sooner by the patient. Continuity of the complaints over a period of years is characteristic. The loss of weight is moderate. Contrary to the first group, introduction of a gastric tube or an esophago-

scope can be accomplished without great difficulty. The use of dilators must be repeated and even then it fails to produce satisfactory results in a large percentage of cases.

Fifty per cent of the entire group, predominantly men, belonged to the third group in which there is no uniform clinical syndrome. The complaints are not constant, there is a sensation of pressure alternating with cramps, vomiting, or intolerance of warm or cold foodstuffs without any definite order. Insidious onset and completely free intervals are characteristic. Emotional instability is more pronounced than in the other two groups. The cardia can usually be entered by instruments.

Whereas spasmolytic drugs and artificial dilatation are usually successful in the first and the third type, an immediate Heller's operation is indicated in the second type. —*Joseph Narat, M.D.*

The Right-sided Approach for Hiatal Herniorrhaphy. J. BORRIE. *Brit. M. J.*, 1958, 2: 728.

THE AUTHOR, from the Dunedin Hospital in New Zealand, reports his experience with an operation through the right side of the chest which was done because of a misdiagnosis. The esophageal hiatus hernia was found and repaired.

The patient was a married woman of 58 years who entered the hospital because of a cyst in the right lower lobe of the right lung. At the time of the operation the right pleural cavity was opened through the right sixth rib. Protruding from the mediastinum was a soft swelling approximately 7 cm. in diameter. On opening this "cyst" and isolating the esophagus in the posterior mediastinum, it was found to contain the stomach. The true diagnosis of hiatal hernia was at once evident. The sac was then excised, and since the heart had fallen to the left side with the patient in the left lateral position, the crura of the diaphragm were readily isolated. The esophagus was raised by a catheter sling and the crura were easily approximated with four double 0000 silk interrupted mattress sutures. This procedure effectively closed the hiatal hernial orifice. The esophagus was next sewn to the diaphragm by a series of interrupted 00 silk sutures. It was surprising how relatively easily this operation was accomplished from the right side of the chest when the customary approach has been from the left. The chest wall was finally closed over water-seal drainage. The patient made an uninterrupted recovery and was discharged 15 days after operation. When seen one year later she was well, had no symptoms, and her swallowing was satisfactory.

—*Peter Dineen, M.D.*

Cortisone Therapy of Corrosive Lesions of the Esophagus (La cortisone dans le traitement des lésions corrosives de l'oesophage). J. LEDERER and J. VANDERVEKEN. *Acta gastroenter. belg.*, 1958, 21: 482.

CORTISONE THERAPY presents progress in the treatment of esophageal lesions caused by the swallowing of corrosive substances.

Rosenberg (*Arch. Surg.*, 1951, 63: 147) recognized the effect of ACTH in preventing experimental lye strictures in rabbits. Krey (*Acta Laryngol.*, 1952, Supp. 102) demonstrated the relationship of secondary infections, excessive granulation tissue formation, and cicatrization. Further experimental studies indicated that cortisone with antibiotics suppressed granulation tissue and fibroblastic proliferation even more effectively. Antibiotics antagonizing the spontaneous bodily defense depressing effect of cortisone have, thus, a dual effect.

The combined therapy of cortisone and wide spectrum antibiotics was successfully applied in a large number of human patients with esophageal corrosive burns. The steroid treatment must be started early as fibroblastic proliferation will start on the third or fourth day. Three hundred to 400 mgm. of cortisone are administered the first day, and the dose is decreased to 100 mgm. for 5 days and continued at 50 mgm. every day for the period of treatment, which should be no less than 6 months.

The complications encountered included gastroesophageal perforations and hemorrhages. It is necessary to recognize that such a complication as mediastinitis secondary to esophageal perforation occurs even without cortisone therapy and carries a high mortality. One patient with gastrointestinal hemorrhage on the sixtieth day after institution of therapy was found to have a gastric ulcer and cortisone was blamed for its activation. Failures in preventing stricture formation may be expected in patients started on cortisone therapy either too late or given treatment for too short a period of time.

—*Karel B. Absolon, M.D.*

Cavernous Hemangioma of the Esophagus. (Kavernoeses Haemangiom des Oesophagus). H. MAJOR. *Zbl. Chir.*, 1958, 83: 1351.

THE AUTHOR found only 3 reports of clinically diagnosed cases of esophageal cavernous hemangioma and their treatment in the literature. The patients were successfully treated by the endoscopic application of radium and/or endoscopic removal.

The author's case was that of a 33 year old female with loss of weight and dysphagia of 7 years' duration. Barium swallowing revealed an intraluminal filling defect, the size of a prune, which was located just above the cardia. Endoscopy revealed an obstructive lesion in the same area. It did not permit the scope to be passed.

Left thoracotomy was performed and a vascular tumor was removed from the lateral wall of the esophagus. The tumor involved the entire thickness of the esophageal wall, but did not penetrate the mucosa. The pathological diagnosis was cavernous hemangioma.

The patient had an uneventful postoperative course. The size of the tumor in this case necessitated removal through a thoracotomy rather than through endoscopic approach. —*Gunars Medins, M.D.*

Primary Nevoepitheliomas of the Esophagus (Naevoépithéliomes primitifs de l'oesophage). E. NÈGRE, H. GUIBERT, and C. CAZALIS. *J. chir.*, Par., 1958, 76: 263.

NEVOEPITHELIOMAS of the esophagus are extremely rare, only 18 cases including the present one having been reported. Twelve of these cases were reported after 1950.

The case here described was one in a series of 150 malignant conditions of the esophagus observed by the authors. It occurred in a man of 59 years suffering from a rapidly progressive dysphagia which became total in a period of 2 months. The dysphagia was painful and accompanied by distress and a sense of choking. Following a negative physical examination, roentgenologic study of the esophagus revealed a round, lacunar image with regular contour behind the aortic arch. It suggested a pedicled tumor inserted in the anterior wall with marked dilatation of the esophagus above it. The esophageal wall in contact with the mass did not appear infiltrated nor even thickened, which suggested a benign tumor. However, esophagoscopy revealed a bourgeoning, easily bleeding, obstructing mass. Since a malignant condition was suspected, the tumor was approached through a combined abdominal and right thoracic route.

The tumor was the size of a large mandarin with thin elastic walls of smooth regular consistency, and occupied the entire retroaortic and supra-aortic esophagus. There were no mediastinal adhesions and no abnormal mediastinal adenopathy. Following resection of the arch of the azygos, the involved esophagus was partially liberated in the supra-aortic and retroaortic portions. A 10 cm. vertical esophagotomy was performed. The tumor was approximately piriform (5 by 4 cm.), had a smooth surface, and was unequally colored, being black at the upper pole and greenish white at the distal extremity. Since it appeared benign, it was removed by broad resection, of its base of implantation, and the esophagotomy was sutured in two planes with a covering of pleural tissue. This operation only slightly constricted the esophageal lumen, which was abnormally enlarged. A drain was inserted in the ninth interspace. Suture of the wall was done with nylon. The patient left the hospital on the fifteenth day, swallowing normally. When seen 6 months later he was in excellent condition and had gained weight. There was no sign of local or distant recurrence, and there remained only a slight reduction in the caliber of the retroaortic esophagus, which remained perfectly regular and supple. Histologic examination of the specimen revealed a primary esophageal melanoma with numerous blood foci containing red corpuscles and cells of the same structure as the tumor. Both blood and lymph emboli indicated the indisputable malignant nature of this tumor, the infiltration being vascular.

Of the cases hitherto reported, 6 occurred in females and 12 in males, the age incidence varying from 40 to 71 years. Only 2 of the patients had a past esophageal history, one a burning sensation upon ingestion of spirits, and the other a mediastinitis. The rapidly progressive dysphagia appears to be the most characteristic symptom and is very painful; it is described as epigastric pain, burning sensations, pseudoulcer, precordial or retrosternal pain, cramps, and intercostal or scapular pain. Regurgitation is rare and usually occurs only in the terminal stages. Sialorrhea and respiratory symptoms are occasionally observed. Emaciation is constant and rapid. Roentgen examination may suggest a malignant condition. In 12 of 14 cases roentgen examination revealed an image that could be interpreted as malignant. In the present case the image suggested a benign tumor. Only one case was diagnosed by biopsy. The site of election for primary malignant melanomas of the esophagus is the lower segment. In one of the 18 cases reported the melanoma was in the middle third of the esophagus, in 3 cases it was in the upper third, and in 14 cases it was in the lower third. The tumor is polypoid, pedicled, and movable in the esophagus, causing obstruction like a foreign body. The pedicle is very short, usually 1 cm. in diameter, and 1 to 2 cm. in length.

Sarcoma of the esophagus may also be pedicled. Voss described a case in which the long pedicle of a melanoma invaginated into the stomach. The tumor is usually black and white and lobular, and it bleeds easily; frequently it is ulcerated. Section shows islets of black soft substance separated by a lighter, less dense, more fibrous layer, with occasional foci of necrosis and hemorrhage. Histologic examination is of the greatest importance in diagnosis. This tumor always springs from the esophageal epithelium. The mucosa and submucosa are very rich in melanoblasts, especially about the pedicle. The melanoblasts are frequently grouped in voluminous capsules. At the periphery of the pedicle one finds the characteristic typical lesion verifying the primary esophageal origin. The classical methods for demonstrating melanic pigments are used. It is suggested that Fontana's nitrate ammoniac silver reaction is just as accurate and simpler. The pigment is present in the tumor, in the cells of the stroma as well as in the distant submucosa. The presence of tumor cells in blood vessels and lymphatics, glands or submucosa, signifies invasion.

The present writers believe that the presence of a junctional nevus in the mucosa justifies the conclusion that the melanoma is of primary esophageal origin.

The authors believe that any operable esophageal tumor should be removed, especially since the nevoepitheliomas frequently appear benign on the screen. The problem concerning the extent of the resection is whether an esophagectomy or merely a resection of the tumor should be done. An infiltrating melanoma must be treated like an epithelioma. Also in nevoepitheliomas of the lower third of the esophagus exeresis by the left subaortic route is usually indicated. In pedicled tumors located in the middle or upper third of the esophagus the unanimous indication has hitherto been "widest resection." However, the immediate and late results of this procedure are not convincing. The authors believe that isolated resection of the tumor and its pedicle may give similar results without risk. The decision is possible only with an open thorax and preliminary gastrolysis. Among the 18 cases reported, 8 of 10 exereses were successful.

—*Edith Schanche Moore*

Hazards Attending the Use of Esophageal Tamponade. HAROLD O. CONN. *N. England J. M.*, 1958, 259: 701.

THE AUTHOR describes experiences with the Sengstaken-Blakemore tube at the Grace-New Haven Community Hospital in an attempt to determine the frequency, character, and significance of the hazards

involved, and to discover how these problems may be prevented or treated. The Sengstaken-Blakemore tube is widely used in the management of hemorrhage from esophageal varices. Several authors have mentioned specific complications encountered during the use of esophageal tamponade. These have ranged from difficulty in insertion of the tube to fatal obstruction of the airway. Others have noted mechanical defects of the apparatus, mucosal ulcerations of the esophagus and nose, and aspiration pneumonia.

The clinical and autopsy records of patients in whom the diagnosis of esophageal varices was made from 1950 to 1957 at this hospital were examined. The records of the 50 patients in whom the tube was used were analyzed. The tube was employed on 81 occasions in 50 patients. The average period of intubation was 78 hours, and the range from 10 minutes to 12 days.

In 19 of these patients major complications developed during the period of esophageal tamponade. Nine of them died as a direct consequence of these complications of the nasogastric tube. In 6 additional patients, factors complicating esophageal tamponade contributed directly to the fatal outcome.

The occurrence of pressure necrosis is considered to be inherent in the use of esophageal tamponade and a small price to pay for a successful outcome. Necrosis of the ala nasi may be prevented by adjustment and padding of the tube, but deep erosions of the pharynx and esophagus are less easily averted. Seventeen of 31 patients exhibited such ulcerations at autopsy. Eight others displayed denuded esophageal mucosa or submucosal hemorrhages. Three patients exhibited lacerations of the esophageal mucosa. These ranged from 1.5 to 5 cm. in length and occurred near the cardioesophageal junction. Each of these 3 patients died after exhibiting severe respiratory distress, and death was caused by the aspiration of bloody gastric contents. The author believes that these lacerations were incurred during the passage or inflation of the tube.

Traumatic rupture of the esophagus occurred in 1 patient.

Obstruction of the airway was the most serious complication of esophageal tamponade. It was responsible for 9 deaths in the present series and contributed to a fatal outcome in numerous other cases. Aspiration of foreign material into the bronchial tree was the most common cause. Occlusion of the air passages by the inflated esophageal balloon occurred less frequently.

Oral, nasal, and pharyngeal secretions that are in excess of 1500 ml. each day can no longer be swallowed, but must be expectorated, removed by suctioning, or swallowed around the tube. In patients with altered consciousness these secretions frequently enter the air passages, causing aspiration pneumonia.

Massive bronchial aspiration of blood or bloody gastric fluid was the apparent cause of death in 8 patients and contributed to death in several others. In 1 case the material aspirated resulted from epistaxis precipitated by nasal suctioning. In each of the others the aspiration of bloody gastric contents followed vomiting.

Occlusion of the airway by the distended esophageal balloon may occur when the gastric balloon no longer anchors the tube in place. This occurred in 4 cases and caused death by asphyxiation in 1 patient who had pulled the balloon into his hypopharyngeal space.

The frequency and severity of these respiratory complications is best illustrated by the fact that tracheotomy was required in 18 patients. In addition, postmortem examination revealed significant degrees of pneumonitis in 16 and of pulmonary atelectasis in 10 of them.

Improper use of the Sengstaken-Blakemore tube tube can be attributed chiefly to inexperience on the part of both house officers and nurses. Most of these problems need no further comment, but some, such as the inadvertent deflation of the balloons, occur far too frequently. Mechanical defects of the Sengstaken-Blakemore tube are common. The most frequent of these is the inability to maintain constant pressure in the esophageal balloon because of air leaks from the hand bulb used for inflation. Rupture of the gastric balloon is also a very common complication and it is almost invariably followed by recurrent esophageal bleeding or airway obstruction. Many other factors may compromise the efficiency of the Sengstaken-Blakemore tube. These range from inability to pass the tube into the stomach to anatomic variations that interfere with its use. Sometimes, it cannot be directed into the esophagus, particularly when it is being reinserted. Local edema and muscular spasm may be responsible. In patients with an esophageal hiatus hernia the gastric balloon may not impinge in the stomach. In addition to inefficient tamponade, such misplaced balloons may obstruct the airway. Occasionally, the tube doubles up in the esophagus or the stomach and interferes with normal functioning of the tube. The tube is frequently used as a means of differentiating hemorrhage from esophageal varices and sites lower in the gastrointestinal tract. It is realized, however, that bleeding from esophageal or gastric varices may persist despite tamponade. It is the author's conclusion that the tube is unreliable as a means of determining the bleeding site.

The conclusions to be drawn are that esophageal tamponade is a difficult and dangerous technique. The author questions whether or not esophageal tamponades should be abandoned. He believes, however, that in spite of the disturbing statistics, it still plays an important part in the treatment of bleeding esophageal varices for a variety of reasons. It is a direct form of therapy, designed to control hemorrhage by the application of pressure at the site of bleeding. Secondly it appears to be effective in controlling hemorrhage from esophageal varices. In 70 per cent of the cases here reported, bleeding was controlled at least transiently. Thirdly, the mortality of patients who bleed from esophageal varices is very high, regardless of the type of therapy employed.

Although it is impossible to eliminate all risks from this technique, greater intimacy with the apparatus and more careful observation of the patients can eliminate most of the more serious problems. The author believes that a new tube should always be used. The balloons should be checked for leaks and asymmetry, and the tubes for patency by trial inflation

of the gastric balloon to 250 ml. He clamps the balloon inlets with a rubber-shod hemostat to prevent leakage. Several other suggestions are made for effective use of these tubes without complications. Traction produced by elastic bands or by weights suspended over the foot of the bed should never be employed. Periodic deflation of the esophageal balloon, as recommended by Blakemore, may prevent some of the effects of prolonged pressure of the esophagus. Roentgenograms should be obtained to detect any abnormal position of the tube. Constant nursing attendance is, of course, mandatory. —*Donald M. Clough, M.D.*

MISCELLANEOUS

Penetrating Wounds of the Thorax (Ferite penetranti del torace). A. Gamba, A. Jovine, and G. Francini. *Acta chir. ital.*, 1958, 14: 553.

The authors' experience in the treatment of a group of 25 cases of thoracic wounds is reported. A lengthy repetition of well known therapeutic concepts, documented by the vast experience of recent wars, is presented along with rather limited information about individual cases.

This group of 25 patients presented chiefly closed thoracic wounds complicated by hemothorax. Two instances of hemopneumothorax, both of moderate severity, and one case of subcutaneous emphysema were also observed. The 3 patients with open thoracic wounds were all in a very critical state and successful surgical treatment was possible in only one.

Thoracic and abdominal wounds with lesions of vital viscera were observed in 5 instances. Foreign bodies (bullets, needles, stones, and metallic fragments) were found in the thoracic cavity in 15 patients, but 7 of them had had foreign bodies in the chest for years and were treated because of late onset of complications or symptoms.

—*Franco F. Sangalli, M.D.*

Mixed Hiatal Hernia of the Posterior Paraesophageal Type (Ernia iatale del tipo paraesofageo misto posteriore). E. Benedini, G. A. Gibelli, and D. Sabbioni. *Acta chir. ital.*, 1958, 14: 639.

The classification of hiatal hernias into two basic types, the paraesophageal (rolling) and the sliding by P. R. Allison of Leeds, England (*Surg. Gyn. Obst.*, 1951, 92: 419) seems to rule present day conceptions of the subject. Allison states that in his experience the paraesophageal hernia was always located anterior to the esophagus, but that J. S. Davidson, in a personal communication, told him of finding at operation a paraesophageal hernia which was situated posterior to the esophagus.

The authors' patient was a 62 year old married nullipara who, for the past 12 years had been suffering from progressively increasing attacks of pain in the epigastrium, and the left thoracic and retrosternal region. Recently pyrosis, acid eructations, and regurgitation after eating had developed and varied considerably with changes in body posture.

The lower end of the esophagus was exposed through a posterolateral incision between the eighth and ninth ribs. The hernial sac, containing the proximal third of the stomach, was found behind the esophagus. The lateral margins of the hiatal ring were extremely thin; the cardia was lying above the diaphragm in the posterior mediastinum (Fig. 1).

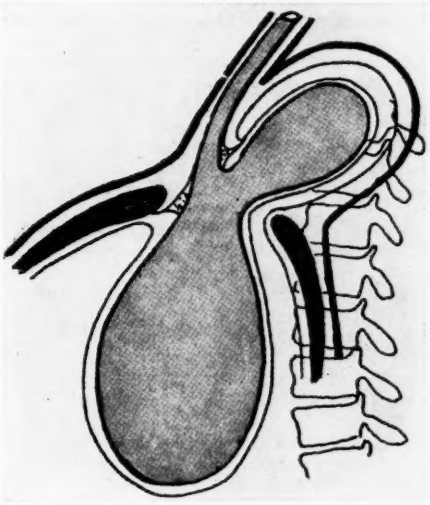


Fig. 1 (Benedini *et al.*).

Return of the stomach and terminal portion of the esophagus to the abdominal cavity was easily accomplished and the hiatal ring was closed posteriorly with heavy linen sutures.

The patient was immediately relieved of symptoms, and the roentgenograms taken 1 month and 1 year after operation showed no evidence of a tendency toward recurrence of the hernia.

The authors agree with Allison that with this particular type of hernia a preformed peritoneal cavity extending through the hiatus must be present, perhaps because of failure of the stomach to bring with it the posterior fornix of the peritoneum into the abdominal cavity. The marked laxness of the perihiatal fascia in the case reported leaves the impression that the hernial forces would at this point meet with lessened resistance. —*John W. Brennan, M.D.*

Arterial Occlusion Complicating Thoracic Outlet Compression Syndrome. C. G. Rob and A. Standeven. *Brit. M. J.*, 1958, 2: 709.

In this article the authors point out the serious results which may ensue if vascular symptoms in association with a thoracic outlet compression syndrome pass unrecognized or are disregarded. For although they may be coincidental very frequently they provide the initial evidence of damage to the subclavian artery. The end result may be loss of fingers, ischemic contracture of the forearm and hand, or a major amputation following occlusion of the main vascular channels by embolism or thrombosis. The authors then go on to discuss three types of problems: brachial artery occlusion, subclavian artery thrombosis, and vascular symptoms associated with a cervical rib.

The authors cite 5 cases of brachial artery occlusion and state that in patients with occlusion of the brachial artery a careful history reveals a sudden onset of ischemic symptoms in the hand typical of an embolism to the brachial artery. There is usually a brachial artery palpable to a point midway down the forearm where it stops. Then, subsequently, there may be a palpable radial pulse. In addition to those caused by embolism there were two cases associated with trauma and with mural thrombi of the subclavian artery.

Complete occlusion of the subclavian artery is less common than embolism in these patients, but may occur as a consequence of local mural thrombosis in one of two ways. First, the thrombus may increase in size until it occludes the vessel. If this process occurs gradually one would expect the collateral circulation to increase steadily. On the other hand rapid occlusion of the subclavian artery would cause symptoms of sudden onset with gradual improvement as the collateral vessels dilated. Secondly, a brachial bifurcation embolus could be followed by consecutive thrombosis, in which case a sudden onset of symptoms would be followed by deterioration, either steadily or spasmodically.

The majority of cervical ribs cause no symptoms, but their owners are no less liable, according to the authors, to other disease than are their fellows. Consequently, it is not surprising that patients are sometimes seen with both vascular symptoms and cervical ribs which are no more than coincidental. When the subclavian artery is raised by a cervical rib or crosses over the sharp or first rib any drag on the arm will angulate the artery over a rigid structure, and a common complaint of these patients is inability to carry a heavy package on the affected side. Thus prolonged drag and angulation may cause an area of mural thrombus. This can be made worse by compression of the artery by the overlying scalenus anterior or clavicle. Periarterial fibrosis may be present in these cases. No matter what the exact theory as to the cause it is clear that once symptoms appear the rib should be removed.

The authors believe that to add upper thoracic ganglionectomy takes only a few minutes and in their opinion this should always be done to secure rapid and maximal dilatation of the collateral vessels around the block in the main channels. Theoretically, one should also excise the affected segment of subclavian artery to prevent further emboli or thrombosis, and replace it with a homograft to restore normal blood flow. However, the authors believe that the latter steps are largely theoretical and are of no real advantage. —*Peter Dineen, M.D.*

SURGERY OF THE ABDOMEN

GASTROINTESTINAL TRACT

Re-Establishment of the Digestive Tract Following Gastrectomy by Means of Inversion of the Transit through the Duodenum (Le rétablissement du tractus digestif aprés gastrectomie par l'inversion du transit duodénal). I. CHIRICUTA. *Acta chir. belg.*, 1958, 57: 242.

THE AUTHOR describes a new technique which consists essentially in complete section through the jejunum and its mesentery (Fig. 1) at a distance of approximately 15 to 20 cm. distal to the duodenojejunal angle. This distance may be increased in the cases (total gastrectomy with resection of the lower end of the esophagus) in which a longer proximal jejunal stump is needed. The proximal end of the jejunum is passed through the mesocolon and, after being curetted free of mucosa for a distance of approximately 5 cm., is used as a sheath for enveloping the distal stump of the esophagus.

The distal stump of the jejunum has been used in two different ways. In the first method the distal stump is passed through the mesocolon and then attached end-to-end to the proximal termination of the duodenum. It seems necessary to anastomose the two loops of the jejunum, at the point where they cross over one another, by means of a Braun anastomosis. During the operation an Einhorn tube is passed into the jejunum and left in place for 7 to 10 days, or until the suture lines are healed. When oral alimentation is begun, the ingested material must pass through the duodenum in a retrograde direction; this, however, is not as unphysiologic as it sounds, since the duodenum is normally able to change from peristalsis to antiperistalsis.

Two patients requiring complete gastrectomy were operated upon with this technique with complete success; the roentgenogram, taken 14 days after operation, showed barium passing through the proximal jejunal loop, the duodenum, and the distal loop without passing through the Braun anastomosis. In the other patient the immediate result was successful but one must wait to see if any disadvantages become apparent later.

With the third patient a variation in the technique was introduced. This technique is illustrated in Fig. 2. The distal stump of the jejunum was carried to the right side of the abdomen and sutured to the upper end of the duodenum by a laterolateral anastomosis. A fistula developed at the suture line and the patient

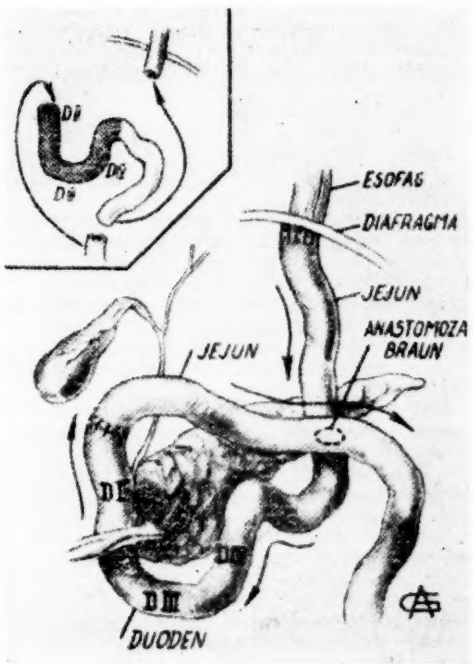


FIG. 1 (Chiricuta).

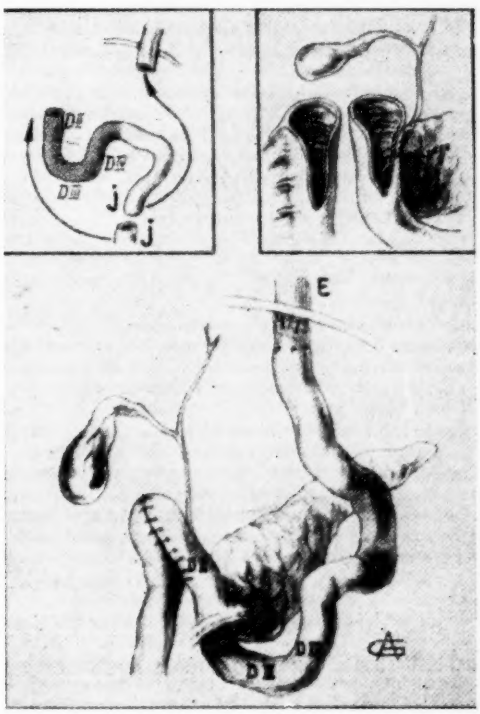


FIG. 2.

died on the twenty-fifth postoperative day. Because of this death the technique, which had proved successful in experiments on dogs, cannot be evaluated.

This last method has not been used with subtotal gastrectomy but experimental results on dogs have been successful. The transit of food was complete and the anastomosis of Braun was obviated.

The purpose of this report is to point out the possibility of conserving active participation of the duodenum in the process of digestion in these patients. The author believes that the method should be considered in cases in which the stomach must be partially or completely removed, and in which gastroduodenostomy (Billroth I) cannot be carried out.

—*John W. Brennan, M.D.*

Duodenal Ulcer Associated with So-called Paraduodenal Hernia (Gleichzeitiges Vorkommen von Ulcus duodeni und sog. paraduodenaler Hernie). A. Viczián. *Zbl. Chir.*, 1958, 83: 1269.

A CASE is presented in which the author performed surgery for duodenal ulcer and in the course of the operation discovered that the jejunum and all but a few centimeters of the ileum were in a hernia associated with the mesocolon. Further investigation revealed that the small bowel could be reduced from the hernial sac and the orifice obliterated.

The developmental anatomy is discussed with particular reference to the rotation of the cecum to the right lower quadrant of the abdomen. It is in the second period of intrauterine growth of the abdominal cavity and intestinal rotation that the cecum may take a direct course from the left upper quadrant into the right lower quadrant. The superior mesenteric artery maintains the small intestine in a cephalad position and upon security of the mesocolon the small intestine is left in an elevated position. The author prefers to term this a "high position of the jejunum and ileum" rather than a paraduodenal hernia.

—*Walter L. Byers, M.D.*

Matching the Operative Procedure to the Patient in Carcinoma of the Colon. F. A. dePeyster and R. K. Gilchrist. *Surg. Clin. N. America*, 1958, October, p. 1343.

THREE FUNDAMENTAL QUESTIONS must be answered before an operative procedure may be matched to a patient having a malignant condition of the colon: (1) What is the nature, extent, and anticipated course of the disease process? (2) What is the risk of surgical intervention, expected morbidity, and anticipated life expectancy? (3) What are the qualities of the professional "team" and are hospital facilities adequate to take care of any anticipated situation? Not until these major factors have been resolved can the surgeon select the most suitable procedure for the patient with carcinoma of the colon. The authors have reviewed the records of 100 consecutive patients who had 113 operations performed for carcinoma of the colon and rectum at the Presbyterian Hospital in Chicago, from 1954 to 1957. There were 3 deaths. The patients varied in age from 36 to 88 years and 27 were 70 years of age or older.

One hundred and nine nonemergency operations were performed with 2 deaths. Both patients who died had palliative surgery for far advanced cancer. Nonemergency surgical treatment of colonic cancer in the average healthy patient seldom presented a difficult problem and usually was attended by a low mortality rate. On the other hand, emergency surgery of colonic cancer, most often performed on a patient with a depleted reserve, was attended by a considerably greater risk and higher mortality. Here, the primary concern was selecting the simplest operation to eliminate the immediate threat to life, while removal of the tumor assumed a secondary role.

Four emergency operations were performed with one death. Two of the patients had perforation of the colon and two others had complete obstruction for which a colostomy was done the day of admission. In addition, 8 other patients were operated upon as "urgent cases" within 24 to 48 hours to relieve incomplete bowel obstruction which had been present from 2 to 10 days.

The elimination of complications associated with the nasal Levine tube by the use of gastrostomy was helpful in matching the procedure to the patient both in emergency and nonemergency situations, particularly in the aged or debilitated individual in whom prolonged ileus was anticipated. The authors believe that gastrointestinal postoperative decompression in this way has lessened the load on the heart, reduced the number of pulmonary complications, and provided considerable comfort for their patients. Sixty-nine of the 100 patients operated upon in this series had a gastrostomy and to date the authors have had no serious complication in more than 500 gastrostomies for postoperative decompression.

—*Matthew H. Evoy, M.D.*

LIVER, GALLBLADDER, PANCREAS, AND SPLEEN

Observations on the Influence of Medical Therapy on Portal Hypertension in Hepatic Cirrhosis. Carroll M. Leevy, Myra Zinke, Julius Baber, and Woo Yoon Chey. *Ann. Int. M.*, 1958, 49: 837.

FIFTY PATIENTS with biopsy-proved hepatic cirrhosis received a series of biochemical tests, hepatic vein catheterization, and splenoportography. Twelve of this group had histologic evidence of mild cirrhosis, 20 had moderate cirrhosis, and 18 had severe cirrhosis. The effects of prolonged rest and dietary therapy, exercise, selected drugs, protein feeding, and alterations of intrapleural and intra-abdominal pressure were investigated.

Biochemical tests, histologic studies, and wedged hepatic vein pressures were obtained using standard techniques. Liver function tests consisted of serum bilirubin, bromsulfalein excretion, serum alkaline phosphatase, serum cholesterol and esters, serum albumin and globulin, the cephalin cholesterol flocculation, serum glutamic oxalacetic transaminase, and serum pyruvic transaminase. Liver biopsy was performed with the Vim-Silverman needle without complications. A double lumen catheter was utilized in hepatic vein catheterization. Initial intrasplenic pulp pressures were obtained at the time of splenoportography and repeated without the introduction of contrast media for serial observations.

Serial studies of wedged hepatic vein and intrasplenic pulp pressures correlated with histopathology in hepatic cirrhosis indicate that fatty metamorphosis, inflammation, and liver cell necrosis contribute to portal hypertension in this disease. Medical therapy may cause reduction or disappearance of an elevated portal pressure in these instances.

Medical management usually has no effect on an elevated wedged or splenic pulp pressure primarily due to nodular regeneration of liver cells, intrahepatic vascular shunts, and inactive fibrous connective tissue. A reduction in intrasplenic (portal) pressure may occur with spontaneous development of collaterals although the intrasinusoidal pressure remains unchanged.

Vasoconstrictor drugs, cough, the Valsalva maneuver, and ascites may produce a marked increase in portal pressure. In cirrhosis with esophageal varices such increments should be avoided.

Circulatory studies are important in hepatic cirrhosis with portal hypertension to establish the level of portal pressure, determine the effectiveness of medical therapy, and evaluate the need to resort to surgical procedures. They have furnished additional information on the natural history of portal hypertension and have provided a more objective method of assessing various therapeutic measures.

—*Charles Baron, M.D.*

The Place of Surgery in Cirrhosis of the Liver. WILLIAM F. PANKE, AUGUSTO H. MORENO, and M. ROUSSELOT. *Surg. Clin. N. America*, 1958, October, p. 1293.

CIRRHOSIS OF THE LIVER has become one of the ten leading causes of death in this country. In the age group between 45 and 64, cirrhosis is outranked as a cause of death only by heart disease, cancer, and cerebral hemorrhage. This fact certainly warrants the increased tempo of investigation of the etiology and treatment of the disease and its manifestations that has occurred during recent years. Treatment of the primary disease, at present, remains for the most part in the realm of medical therapeusis. However, surgical procedures such as those based on the striking regenerative power of the liver following partial resection are being tried and evaluated.

It would appear that many cirrhotic patients might attain satisfactory longevity were it not for the complications of cirrhosis, such as the development of portal hypertension with hemorrhage from gastroesophageal varices, the formation of wasting ascites, and, less frequently, the occurrence of hepatomas. It is in the amelioration of these lethal factors that surgery has its major usefulness. Numerous procedures are being given experimental and clinical trials for the control of ascites.

Realizing the great difficulty in distinguishing the bleeding of esophageal varices from hemorrhage from lower lesions such as peptic ulceration, the authors have called attention to the valuable help that they have received from combined splenic manometry and percutaneous serial splenoportography. A high degree of correlation has been observed between the values of the pressure in the splenic pulp and the extent of portal congestion and collateralization. The test has proved practical and reasonably safe with these investigators. No serious accident requiring laparotomy has ever occurred in more than 200 splenic punctures. On only four occasions has transfusion been necessary to replace the blood lost from splenic hemorrhage following the needle puncture.

If the splenic pulp pressure is definitely elevated (greater than 350 mm. of water), a tentative diagnosis of esophagogastric varices is usually confirmed by portography. If, however, the pressure is within normal range (up to 250 mm. of water), it can be assumed that portal hypertension does not exist. It has been found that the great majority of patients who bleed from varices, however, have pressures in excess of 350 mm. of water and not uncommonly in the range of 400 to 600 mm.

In approximately 10 per cent of patients with bleeding varices the bleeding cannot be controlled by ballon tamponade because of the presence of gastric varices bleeding distal to the gastric ballon. This situation is usually recognized by the continuous drainage of fresh blood from the gastric tube. A number of these patients will succumb without ever being able to be seriously considered for operation. Others may suffer transient coma and recover following temporary cessation of bleeding and the usual measures of blood replacement, colonic irrigation, catharsis, and intestinal antibiotics. In these individuals coma may be largely due to absorption of nitrogenous products of hemoglobin breakdown and may not necessarily indicate irreversible hepatocellular damage. An effort is made to eliminate the major source of increased serum and cerebrospinal fluid ammonia levels by hourly gastric irrigations and twice-daily colonic irrigations with saline solution. Magnesium sulfate catharsis is customarily given every 6 hours by way of the gastric tube. The adjuvant measure of amino acid (glutamic acid, arginine) therapy to block the neurotoxic effects of the already absorbed ammonia may result in a greater number of survivors. In addition, blood volume is maintained by means of fresh, whole blood transfusions since the increasing ammonia content of aging, banked blood is now well recognized. Infusions high in carbohydrate and vitamin content are also used.

When an emergency operative procedure seems warranted, the authors advocate the use of only two approaches: direct end-to-side portacaval shunt and transgastric or transesophageal ligation of the varices. The former procedure is, of course, definitive for control of portal hypertension and cessation of bleeding. It is, however, a time-consuming and technically more difficult procedure than simple ligation of varices. Emergency shunting, in their opinion, should not be undertaken without portographic evidence that the portal vein is patent and free of thrombosis, an unfortunate development which is encountered in approximately 10 to 15 per cent of patients with cirrhosis. Occasionally, because of the urgency of operation, even a single film portogram taken during the procedure or immediately preoperatively with a portable x-ray machine is of value in determining portal vein patency.

The procedure of choice when an elective operative procedure can be carried out is a direct end-to-side portacaval shunt. In order to be considered satisfac-

tory, the shunt must be technically adequate and in these authors' experience an 80 to 200 mm. of water decrease in pressure must be attained to achieve protective decompression.

The results of direct end-to-side portacaval shunts are uniformly good. Closure is rare and has never occurred in the authors' experience. Recurrent bleeding from esophagogastric varices has not been observed. Operative (hospital) mortality in elective cases still ranges between 10 and 15 per cent when poor risk cases are included.

—*Matthew H. Evoy, M.D.*

Acute Cholecystitis; Timing of Cholecystectomy, A Study on the Postoperative Course in 895 Cases. A. YNGVE and J. OLSSON OLOF. *Acta chir. scand.*, 1958, 115: 284.

A SERIES of 895 cases of acute cholecystitis was analyzed in an effort to determine the best time for operative intervention. These patients were operated upon during a 16 year period from 1940 to 1955. Ninety-eight per cent had cholecystectomy and the remainder had cholecystostomy or drainage alone.

Mortality was approximately three times as high during the first 8 years of the study as it was during the second 8 years, being 7.4 per cent of 258 cases from 1940 to 1947 and 2.7 per cent of 637 cases from 1947 to 1955.

In approximately a fourth of the cases, operation was done as an emergency with a mortality of 8.8 per cent of 251 cases. The nonemergency group contained 644 patients and the operative mortality was 2.2 per cent.

The majority of the patients who succumbed to surgery were more than 60 years of age. In this age group there was a decrease in mortality from 17.8 per cent during the first 8 year period to 5.1 per cent during the second period.

During the first 8 year period, the mortality among men operated upon as emergencies was 4 times as high as among women (23 per cent as against 5 per cent). During the second 8 year period the death rate for the two sexes in the group of patients showed no significant difference (10 per cent and 5 per cent). In the nonemergency group, the mortality was roughly equal for the two sexes for each of the 8 year periods.

Mortality was highest among patients operated upon during the first 24 hours after onset (17.3 per cent). The mortality from the second to seventh day was 5.4 per cent. The chief cause of death of patients operated upon during the first week was heart failure (9 of 17 cases). Other causes of death were: pancreatic necrosis (3 cases), peritonitis (2 cases), infection of congenital liver cysts (1 case), postoperative hemorrhage (1 case), and hepatic failure (1 case).

In the nonemergency operative cases, there was a tendency to delay operation in the second 8 year period as compared to the first, and in the second period only half were operated upon during the first 7 days of the attack. No deaths occurred among 80 patients operated upon within 3 days of onset in this group. Most deaths occurred in the patients operated upon more than 7 days after onset. The causes of death in this group were pancreatic necrosis (2 cases), hemorrhage (2 cases), cardiac complications (2 cases), hepatic failure (3 cases), intestinal obstruction (1 case), pulmonary embolism (3 cases), and abscesses (1 case).

This study and a previous one reported by the authors in which the histories and character of acute cholecystitis were considered, have led to the following recommendations:

1. The patient should be operated upon with cholecystectomy during the initial hospitalization.

2. In cases in which the signs and symptoms are mild, the operation should not be performed until any existing cardiac, vascular, electrolyte, or fluid disorders have been corrected, preferably between the fourth and seventh days after onset.

3. Hyperdiastasuria not accompanied by clinical signs of acute pancreatic disease should not influence the indications for operation of acute cholecystitis.

4. Preoperative cholecystography is advisable in every case.

—*F. W. Preston, M.D.*

Relative Diagnostic Significance of Bilirubin and Phosphatase Values in the Postcholecystectomy Syndrome. GUNNAR JONSSON. *Acta chir. scand.*, 1958, 115: 299.

THE AUTHOR defines the postcholecystectomy syndrome as episodes of pain in the central or right portion of the epigastrium, usually radiating toward the back and accompanied by dyspeptic discomfort of varying types occurring in the cholecystectomized patient. The chief problem in treating these patients is to decide whether or not there is a mechanical obstruction to the flow of bile into the intestine.

The activity of the serum alkaline phosphatases, the icterus index, and the findings at operative exploration of the common bile duct are reported in a series of cases of the postcholecystectomy syndrome. The phosphatase activity was elevated in 15 of 21 patients with mechanical obstruction of the common or hepatic duct, whereas the icterus index was normal in 7 of these 15 patients. In none of the 21 cases of obstruction was normal phosphatase activity combined with an elevated icterus index. Dissociation of this type between laboratory tests was appreciably less common in patients without mechanical biliary tract obstruction. The study shows determination of the serum alkaline phosphatase activity to be of greater significance in assessing the cause of the postcholecystectomy syndrome than the determination of the icterus index.

—*F. W. Preston, M.D.*

Hereditary Hyperparathyroidism Associated with Recurrent Pancreatitis. CHARLES E. JACKSON. *Ann. Int. M.*, 1958, 49: 829.

THE PURPOSE of this article is to report 6, possibly 7, cases of hyperparathyroidism in two generations of one family associated with recurrent pancreatitis in at least two instances. The hyperparathyroidism was proved in two brothers, in a maternal uncle and aunt by excision of parathyroid adenomas, and was established in their mother and another uncle by the finding of repeated chemical abnormalities.

These instances of the association of the two conditions and those found in the literature suggest that pancreatitis may at times be secondary to hyperparathyroidism.

—*Charles Baron, M.D.*

The Treatment of Pancreatitis (Zur Frage der Therapie der Pankreatitis). E. WERLE, K. TAUBER, W. HARTENBACH, and M. M. FORELL. *Muench. med. Wschr.*, 1958, 35: 1265.

SIXTEEN CASES of acute pancreatic necrosis were treated, on the recommendation of E. J. Frey and E. Werle, with proteinase inactivator or the so-called "inactivator of glands", which is present in large amounts in the liver, spleen, lymph glands, and parotid glands of cattle and has the power of inactivating, not only kallikrein (Frey's circulatory hormone), but also, to a greater or lesser degree, the power of activating trypsinogen to trypsin and lipase.

In 3 of 16 patients the diagnosis was made by exploratory laparotomy after diagnosis of perforation of a gastric or duodenal ulcer. The remaining 13 patients presented the classic signs of pancreatic necrosis with intense upper abdominal pains radiating into the left shoulder, circulatory collapse, and high diastase titers of the blood and urine.

All the patients, whether operated upon or not, were treated with infusions of the gland inactivator, in quantities of 10,000 to 40,000 units in 1,000 c.c. of physiologic saline or dextrose solution per day. Food and fluids were prohibited for the first 3 or 4 days. To relieve pain the patients were given opiates and other sedatives, and circulatory stimulants when necessary.

In 5 patients the clinical diagnosis was later substantiated by biopsy findings, that is, they were later, after the acute state of shock had receded, operated upon for gallstones.

Two patients died; all the others recovered with striking rapidity under the inactivator therapy. In one case, in which heavy doses of the inactivator did not bring satisfactory relief, a pancreatic cyst was later discovered and an operation was carried out. The authors believe that in this patient the pancreas was already heavily damaged before the therapy was started and the cyst was secondary to this destruction.

The following dosage for these patients is tentatively proposed:

First day: 15,000 I.U. in continuous drop infusion, Second and third days: 10,000 I.U. in continuous drop infusion, Fourth to eighth days: 5,000 I.U. in 3 slow intravenous injections, Ninth to fourteenth days: 3,000 I.U. in 3 slow intravenous injections.

This report is given for the purpose of stimulating the experimental and clinical study of this proteinase inactivator (Bayer A128).

—John W. Brennan, M.D.

Infarcts of the Pancreas. JOHN W. MCKAY, ARCHIE H. BAGGENSTOSS, and ERIC E. WOLLAEGER. *Gastroenterology*, 1958, 35: 256.

THE AUTHORS studied 41 cases of pancreatic infarction, in the absence of acute necrotizing pancreatitis, obtained from the records of 21,481 consecutive autopsies performed at the Mayo Clinic from 1924 to 1955. Every attempt was made in this study to eliminate cases of acute hemorrhagic necrotizing pancreatitis. The lesion is uncommon, with an incidence of 0.19 per cent. Infarcts of the pancreas are most commonly associated with primary disease characterized by occlusive lesions of the arteries, such as, periarteritis nodosa (15 cases) and malignant hypertension (12 cases) comprising 66 per cent of the series. Ten cases occurred in females and 31 cases in males.

The relationship between infarcts of the pancreas and acute necrotizing hemorrhagic pancreatitis is not too well defined, but this study shows that lesions of each type may exist independently of the other and can be distinguished by their respective gross and microscopic appearance.

Twelve of the patients in this series experienced pain in the upper abdomen prior to death. In 2, this pain was on the basis of coronary artery disease. Of the remaining 10, 3 had pain patterns consistent with pancreatitis; studies of the serum enzymes were normal in all 3 cases. In the remaining 7 cases, some features of pancreatitis were suggested, but no enzyme studies were made. In only 1 case the pancreatic infarct was massive.

Among these 41 cases of infarction, occlusive lesions of the arteries were found in 30 with thrombi or lesions of the arterial wall or both, and in 3 with emboli, a total of 80 per cent. In 8 cases without arterial occlusion, there was shock or congestive heart failure, or both, which may have caused ischemic infarction of the pancreas.

The authors conclude that it seems probable that in some instances pancreatic infarcts may produce significant clinical symptoms and that acute necrotizing pancreatitis is rarely caused by pancreatic infarction.

—John J. Hudock, M.D.

Problems in the Surgical Treatment of Pancreatic Cysts. JAMES T. PRIESTLEY and WILLIAM H. REMINE. *Surg. Clin. N. America*, 1958, October, p. 1313.

A RELATIVELY SIMPLE grouping of pancreatic cysts serves adequately for practical clinical purposes. The following listing has been found satisfactory: (1) congenital and developmental, (2) retention, (3) pseudocysts, (4) neoplastic, and (5) parasitic.

True congenital cysts of the pancreas occur only infrequently. They may be small, single, or multiple. They ordinarily do not cause symptoms or disturbances of pancreatic function. Likewise, inclusion cysts are encountered rarely. They again are usually small and symptomless.

Retention cysts of the pancreas may result from an obstruction to some portion of the pancreatic ductal system. They do not result from acute, complete ductal obstruction but more likely occur in association with a gradually developing partial obstruction. They may be small or may reach considerable size. Starting within the pancreas, as a rule, they extend beyond the gland and may present in a variety of areas depending upon their original location and on local anatomic relationships. Usually these cysts contain relatively clear fluid, in which all the pancreatic enzymes are found. They have a lining of epithelial cells, unless long-standing intracystic pressure has resulted in such flattening of these cells that they are no longer recognizable. The wall of the cyst is usually demarcated from adjacent structures. They are normally thin-walled and occasionally they are multilocular in type.

Pseudocyst of the pancreas is definitely the most common type of cystic lesion that the surgeon finds associated with the pancreas. As the name implies,

this is not a true cyst in that there is no true cyst wall with an epithelial lining. Actually, these cysts commonly arise adjacent to the pancreas and consist of peripancreatic collections surrounded by a wall of fibrous tissue which is intimately adherent to all surrounding structures. Etiologically, such cysts may result from an extravasation of blood, tissue juices, or pancreatic juices secondary to trauma, or they may result from collections secondary to an attack or repeated attacks of acute pancreatitis.

Fortunately, neoplastic cysts of the pancreas are relatively uncommon. Those encountered most often are cystadenoma or cystadenocarcinoma. Cystic hemangioma or hemangioendothelioma has been encountered. It is not uncommon for a carcinoma of the pancreas to have cystic formation but this condition is not generally thought of as a primary pancreatic cyst. The contents of the cyst may be bloody, rather thick and brownish, or relatively colorless and clear, although the last is uncommon. The lining of the cyst wall is usually irregular, and papillary projections may be numerous or sparsely placed within the cavity of the cyst.

Parasitic cysts are uncommon in the United States, and these authors report that they have never seen one. Echinococcus and Cysticercus cysts have been reported.

The authors report their experience with various treatments of pancreatic cysts and in general, discourage marsupialization of these cystic masses. They believe that the cyst should be removed whenever technically possible, but otherwise internal drainage is the procedure of choice.

—*Matthew H. Evoy, M.D.*

Microsplenic Forms of Splenoportal Obstruction (Le forme microspleniche dell'ostruzione spleno-portale). G. Sotgiu, C. Cacciari, and E. Pisi. *Minerva med.*, Torino, 1958, 49: 3247.

The authors report on their experience with splenoportography and they have observed 60 cases with occlusion of either the splenic or the portal system. The usual finding with splenic obstruction is an accompanying enlarged spleen; however, in 8 patients the spleen was not enlarged. In classifying these patients it was found that the obstruction was secondary to neoplastic invasion of the splenic vessels in 6 of the 8 patients. The authors are of the opinion that in patients with splenic obstruction and a nonpalpable spleen the possibility of a malignant condition should be seriously considered.

In trying to explain the findings they suggest that the gradual obstruction of the splenic vein allows the normal spleen to compensate for the increased pressure without increasing in size. The probable gradual closure of the splenic artery may also be a factor. The observation is clinically interesting and the authors believe that it warrants further investigation.

—*Lucian J. Fronduti, M.D.*

Cysts of the Spleen. Deward O. Ferris, Malcolm B. Dockerty, and Rudolph A. Helden. *Minnesota Med.*, 1958, 41: 614.

Cysts of the spleen are rare, representing the least frequently encountered cystic disease involving abdominal viscera. A study has been made of 19 cystic spleens surgically removed at the Mayo Clinic over a period of 46 years. These nonparasitic cysts of the spleen were divided into capsular types (5 cases) and parenchymatous types (14 cases). The former are multicentric, small, and clinically unimportant. Pathologically, they appear to be derived from lymphatic spaces or peritoneal mesothelium. The parenchymatous category includes epidermoids, cystic hemangiomas, and large unilocular cysts of uncertain origin. To label the latter "true" or "false," depending on the presence or absence of an "endothelial" lining, is impractical since many of the cysts would be labeled "true-false" by this criterion.

Large cysts originating in the splenic parenchyma are symptomatic but do not cause hypersplenism. The greatest single aid in diagnosis is a roentgenologic examination. The treatment of this rare condition is splenectomy.

GYNECOLOGY

UTERUS

Predictive Value of the Positive Vaginal Smear. MARGARET T. MCLENNAN and CHARLES E. MCLENNAN. *West. J. Surg.*, 1958, 66: 258.

IN TWO YEARS 15,600 cytologic smears from 11,711 women were examined by the authors. Positive vaginal smears were found in 165 women not previously known to have cancer, or in 1.4 per cent of the total number surveyed.

Cancer was demonstrated by tissue examination in 109 (66 per cent) of the "positive" cases, but 47 (28.5 per cent) of the women with positive smears did not appear to have cancer. In the remaining 9 instances, follow-up information was incomplete. Thus, the incidence of proved cancer in the entire group of 11,711 women subjected to screening was 0.93 per cent.

Diagnostic intervention after only a single positive smear yielded unequivocal cancer in somewhat less than three-fifths of the patients under suspicion. But if tissue examination was postponed until a series of two or more positive smears had been obtained, then more than four-fifths of the patients proved to have cancer.

Positive smears from patients who did not prove to have cancer often were associated with vaginal or cervical infections, basal cell hyperplasia of the cervix, atrophic epithelia and cervical or endometrial polyps.

The value of maintaining a high index of suspicion in the interpretation of vaginal smears is stressed, but this attitude on the part of the laboratory personnel must be made known to physicians submitting material for screening, lest unwarranted assumptions be made on the basis of equivocal cytologic evidence only. —*Ely Elliott Lazarus, M.D.*

Squamous Cell Papillomas of the Uterine Cervix, A Report of 20 Cases. HENRY L. KAZAL and JOSEPH P. LONG. *Cancer*, 1958, 11: 1049.

SQUAMOUS CELL PAPILLOMA of the uterine cervix is a benign epithelial neoplasm arising on the vaginal portion of the cervix and consisting of stratified squamous epithelium supported on projecting papillas or cores of connective tissue.

A satisfactory classification of squamous cell papillomas of the cervix includes two main categories: (1) the solitary cervical lesions; and (2) multiple lesions involving the cervix and one or more additional surfaces (vagina, vulva, perineum), commonly referred to as condyloma acuminatum. The lesions in both categories may be found during or shortly after pregnancy, or may appear with no apparent relationship to pregnancy.

There were 8 patients in the group of solitary papillomas unrelated to pregnancy, ranging in age from 20 to 69 years. Three were in the third decade, and the remaining 5 were in the fifth, sixth, and seventh decades. With the exception of 2 Negro patients, all were white.

Of the 3 younger patients, 2 complained of irregular vaginal bleeding for 6 months to 1 year; 1 complained only of persistent vaginal discharge. The lesions were soft, broad-based, pinkish-red papillary growths; each measured approximately 1 cm. in diameter and encroached on the external os. Excisional biopsy in each case revealed squamous cell papilloma.

Of the 5 older patients, 4 presented with postmenopausal bleeding; in the fifth patient the lesion was noticed 18 months after radiation therapy for squamous cell carcinoma of the cervix. The lesions were well demarcated, gray to pinkish red, and ranged in size from 8 mm. to several centimeters. Two were attached by broad peduncles; the remaining lesions were sessile. Only the largest lesion encroached on the external os. The clinical impression in 4 cases was papilloma; the possibility of carcinoma was strongly considered in 1 of these. In all cases, histologic examination of the excised lesions revealed squamous cell papilloma. There have been no recurrences in 4 cases, the periods of observations ranging from 6 months to 9 years.

There were 6 patients in the group of solitary papillomas related to pregnancy, ranging in age from 18 to 35 years, the average being 23 years. Four of the patients were Negroes and one was a Puerto Rican. Five of the lesions were discovered during the first and second trimesters of pregnancy, the sixth appearing 1 month postpartum. In all cases, the lesion produced no symptoms, being discovered either on routine examination or on examination of individuals with symptoms of impending abortion. The lesions were solitary, well demarcated, irregular, warty, and gray-red. With one exception, they were located close to the external cervical os. The majority of the lesions were 1 cm. or greater in diameter.

Although various factors, particularly viral and hormonal, concerned with the development of these lesions are discussed, the problem of etiology is still unsolved. The lesions are basically benign but can simulate carcinoma and may be associated with an apparently unrelated carcinoma. Occasional transformation to squamous cell carcinoma occurs, the present data pointing to the solitary lesion in the nonpregnant individual as having this potentiality.

—*Ely Elliott Lazarus, M.D.*

Total Population Screening for Cervical Cancer. PURVIS L. MARTIN. *West. J. Surg.*, 1958, 66: 288.

PRIVATE PHYSICIANS in San Diego, California, have for several years carried out an increasing program of Papanicolaou screening. The last survey showed that approximately 137,000 women had been screened by private physicians and more than 600 cervical cancers in the intraepithelial or early invasive stages were detected. These cancers have all been eliminated from the population. In order to make the project more complete, the San Diego County Medical Society assumed leadership through a Uterine Cancer

Control Committee. This committee includes gynecologists, pathologists, internists, and general practitioners. This committee directs the Uterine Cancer Registry which serves as a clearing house for problems and disputes arising in the program, as a central filing place for records of all women who have been screened, and as a recall center to remind physicians when rescreening is due. A file is maintained on all cancers that have been discovered. While mortality figures are not yet available, it would appear that cancer of the cervix is more than ever likely to become a preventable disease through this screening and rescreening program. —*Ely Elliott Lazarus, M.D.*

The Possible Role of Smegma in Carcinoma of the Cervix. HENRY C. HEINS, JR., E. J. DENNIS, and H. R. PRATT-THOMAS. *Am. J. Obst.*, 1958, 76: 726.

THE CIRCUMSTANTIAL EVIDENCE for a relationship between carcinoma of the cervix in women and smegma is given.

Whole raw human smegma, sterile smegma, Mycobacterium smegmatis cultures, with and without 5 per cent cholesterol, mixed bacterial cultures, and methylcholanthrene were placed into the vaginas of mice at varying intervals and by several techniques. Observations of the surviving mice were made over a period of 14 months and compared with controls. Cancer of the cervix was produced in some dba-1 strain mice exposed to human smegma for 14 months. Wistar strain mice did not exhibit cervical cancer after prolonged exposure to human smegma. —*Alan Rubin, M.D.*

The Elective Therapy of Uterine Corpus Carcinoma (Die elektive Therapie beim Gebaermutterkoerperkarzinom). H. MARTIUS. *Deut. med. Wschr.*, 1958, 83: 1641.

THE AUTHOR seeks to answer six questions with reference to corpus carcinoma: (1) What is the present day attitude with respect to surgery and radiation as methods of management? (2) Should "prophylactic" radiation therapy be given postoperatively? (3) Is an extended radical operation advantageous? (4) What is the preferable method of administering radiation? (5) Which is the preferred approach in operating for corpus carcinoma, the abdominal or vaginal route? and (6) What does the future hold as to advances in the treatment of corpus carcinoma?

1. Surgery consisting of complete hysterectomy and bilateral salpingo-oophorectomy should be performed whenever possible, with radiation alone reserved for the old, the infirm, the obese, and those with circulatory insufficiency. In some institutions preoperative radium treatement is favored and is thought to increase the cure rate.

2 and 3. Six to 8 weeks after surgery "prophylactic" x-irradiation is given to destroy any carcinoma in the regional lymph nodes. It has been estimated that these nodes are involved in more than 20 per cent of the cases. Postoperative x-ray therapy is probably more efficient in eradicating spread from the nodes than is initial radical surgery with node dissection, and for this reason the Wertheim operation is not advocated. If there is carcinomatous involvement of both cervix and corpus, then the Wertheim operation is preferable.

4. When radium is given, the uterus should be packed with small units. X-ray therapy should be directed at the minor pelvis, and should be preferably rotational in character. Cobalt therapy is advisable when available.

5. The abdominal surgical approach is still the favored one, although more and more advocates of vaginal surgery are appearing. Either method may be followed by vault recurrences; these are prevented by either preoperative radium packing of the corpus and cervical canal, or by radium ovoids used postoperatively.

6. The hope of the future lies in early diagnosis and in selective individualization of cases.

—*Warren R. Lang, M.D.*

Injuries to the Urinary Tract Following Radical Hysterectomy for Carcinoma. J. KEITH CROMER. *South. M. J.*, 1958, 51: 1273.

IN THE LIGHT of present day knowledge, the statement that radical hysterectomy for carcinoma of the uterine cervix is a hazardous undertaking and is frequently associated with injuries to the urinary tract appears valid.

The 9 cases presented in this series were obtained from the George Washington University Cancer Clinic, from the George Washington University Hospital, and from the author's private practice. Both ward and private patients are included. Only those patients with accidental injuries to the urinary tract following definitive pelvic surgery, exclusive of exenteration procedures, for the elimination of cancer have been included. Their case histories show that none had had any abnormality of the urinary tract prior to the operation.

Careful scrutiny of the urinary tract prior to operation is important. The unsuspected finding of a dilated ureter prior to operation may suggest clinically an extension of the disease, and indicate the need for a more radical type of surgery than that contemplated. In the patient with a dilated ureter, as well as in the short, stocky, obese patient, the use of retrograde pyelography, with placement of ureteral catheters before operation, is often helpful.

Radical hysterectomy is a difficult and hazardous procedure even in the hands of the skilled surgeon and should never be undertaken without the proper medical and psychologic preparation of the patient for any of several serious procedures, including surgery of the large intestine. During the performance of the operation radical isolation and gross denudation of the ureter from the brim of the pelvis to its insertion in the bladder are to be avoided. Such an operation will add little to the cure of cancer and is very likely to contribute to ureteral occlusion and/or fistula. It has been amply demonstrated in several of the cases presented in this series that surgical trauma to tissue in the immediate vicinity of the ureter leads to scar formation, which may result in ureteral stricture and loss of kidney function, with or without external fistula. Ureteral occlusion which leads to the loss of function in one kidney is of grave concern since it places the patient's life in jeopardy in the event the remaining kidney is compromised, not to mention the possibility of latent infection in the

damaged kidney. The avoidance of such ureteral injuries can be accomplished in most instances by leaving the periureteral connective tissue and mesial peritoneal flap attached to the upper two-thirds of the pelvic portion of the ureter and by careful preservation of ureteral blood supply.

—John R. Wolff, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

The Stein-Leventhal Syndrome. MICHAEL L. LEVENTHAL. *Am. J. Obst.*, 1958, 76: 825.

AN EXTENSIVE review of the Stein-Leventhal syndrome is given. Although the pathogenesis has not been established, it is considered a possibility that the ovarian changes are due to a "chronic" stimulation by luteinizing hormone. It is possible that the adrenal cortex as well as the ovaries may be involved in the symptomatology in some cases, but this association has not been clarified. Of the many conditions producing amenorrhea, enlarged ovaries, and hirsutism, which must be differentiated from the Stein-Leventhal syndrome, mild adrenal hyperplasia is most important. Determinations of the urinary excretions of the 17-ketosteroids and the "pregnane complex" and the use of the cortisone suppression test are valuable aids in the selection of patients for wedge resection. *—Alan Rubin, M.D.*

Histological and Clinical Considerations of Brenner's Tumor (Considerazioni anatomo-cliniche sul tumore di Brenner). R. LEONARDI and G. BELLINVIA. *Arch. ital. pat. clin. Tumori*, 1958, 2: 741.

THE AUTHORS evaluate and correlate 2 personal cases of Brenner's tumor and all the data available in the literature. A meticulous analysis of the macroscopic and microscopic characteristics, histochemical attributes, and histogenesis of this tumor is given.

They conclude that this type of tumor is a relatively rare ovarian neoplasm which is developed from a variety of different histological structures, all of them, however, with the same embryological origin. They remark that as this tumor is benign and has no hormonal activity, it may become malignant and also have endocrine activity in a variable number of cases. This neoplasm accounts for less than 1 per cent of all the ovarian tumors and frequently is a laparotomy or autopsy finding. *—Ruben Brochner, M.D.*

Everting Suture Technique in End-to-End Anastomoses of Uterine Tubes. An Experimental Study (Anastomosi termino-terminale tubarica con sutura evertente). FRANCO BERTOCCHI and ORLANDO ROSSETTI. *Q. clin. ostet. gin.*, 1958, 13: 371.

THE AUTHORS describe the experimental evaluation of a variation of techniques for end-to-end tubular anastomosis. Rabbits weighing at least 5 kgm. were used for the study. A large, but undetermined, number was used. Through a midline laparotomy incision, one of the tubes was exposed, a small segment excised, and the continuity re-established over a small polyvinyl tube. Through-and-through interrupted everting sutures were used. No mention is made of the type of suture material used other than that it was very fine.

The sutures were placed by directing the needle obliquely toward the edge of the wound in such a manner that the point of entry on the serosa was 0.5 cm. from the edge of the wound and the mucosa was penetrated 2 to 3 mm. from the edge, and inversely on the other side. When the stitches placed in this manner were tied, the mucosa of the tubes was everted.

The rabbits were reoperated upon at varving intervals of time and further sections of tube were removed with reanastomosis. Healing of the anastomosis was evaluated several months later by removing the entire tube and dividing it sagittally. In no instance was there evidence of adhesive formation or narrowing of the tubes at the sites of anastomosis. In all instances there was evidence of complete mucosal regeneration with reformation of ciliated epithelium at the anastomotic sites. In several instances lipiodol injections into the uterus were given and patency of the tubes was revealed. *—René Menguy, M.D.*

Experimental Endometriosis in the Human. JOHN H. RIDLEY and I. KEITH EDWARDS. *Am. J. Obst.*, 1958, 76: 783.

MENSTRUAL BLOOD was collected aseptically from the endometrial cavity in 8 patients. The centrifuged sediment was injected onto the midline of the abdominal fascia of the patient from whom the blood had been obtained. Cellulitis developed at the injection site in one patient and she was excluded from the study. When the injected area was excised at the time of laparotomy and studied microscopically, definite endometriosis at the implantation site was found in 1 of the 7 subjects, and possible evidence of early growth of acini was found in another.

—Alan Rubin, M.D.

EXTERNAL GENITALIA

Comparative Considerations About Paget's Disease of the Breast and Vulva (Vergleichende Betrachtungen ueber die Paget-Erkrankung der Mamma und Vulva). E. BONTKE. *Geburtsh. & Frauenh.*, 1958, 18: 1185.

THE CHARACTERISTIC HISTOLOGICAL PICTURE of Paget's disease consists of a localized new growth with large vesicular, mucin-containing Paget cells in the thickened epidermis. A few single cases of the tumor in locations other than the breast and vulva have been described, e.g., in the axilla, male genitalia, on the back, the nose, and the lip. A collection of 40 proved cases of Paget's disease of the vulva was assembled from the world literature. Thirty-five of the women were more than 50 years of age and 6 had cancer of the cutis at the first examination; 3 others developed it later. Metastases were seen in only 3 of these women.

The author describes the case of a 78 year old woman with a vulvar lesion of five years' duration. A microscopic diagnosis of Paget's disease was finally made. Valuable information was obtained through careful histochemical investigations, and an acid mucopolysaccharide was discovered in the plasma of the typical Paget cells. This case demonstrated that the disease can remain untreated for years when located in the vulva, and cancer is associated with it in only a small portion of cases. In Paget's disease of the breast, however, cancer is practically always

present and metastasizes often, usually in only a few months. This difference in biological properties in morphologically identical lesions gives rise to interesting speculations and reminds one of a somewhat similar situation with respect to squamous cell carcinomas.

—W. Dieter Bergman, M.D.

The Use of the Z-Plastic in the Surgical Correction of Vaginal Septa. ARTHUR ADAMSKI. *Plastic & Reconstr. Surg.*, 1958, 22: 250.

THE VAGINAL SEPTUM is a congenital malformation not uncommonly encountered in gynecologic practice. It is a transverse membrane of varying thickness which can be found at different levels in the vagina and which can be either perforate or not. As the Z-plastic procedure applies only to perforate septa, the imperforate septa must be first rendered perforate surgically. Some of these septa are not to be operated upon as they are clinically asymptomatic to the point of being completely ignored by the patients. Other septa, on the contrary, may be the cause of serious gynecologic and obstetric disorders, such as dyspareunia, leucorrhea, dysmenorrhea, and dystocia.

The surgical method of total excision employed up to the last war was, however, unsatisfactory. Excision often caused side-effects, such as retraction and defective scars, so that the final condition was worse than that existing before the operation. At present, only plastic surgery can be considered. A normal vaginal cavity is reconstructed by suppressing the septum while not excising any vaginal tissue. In plastic surgery, the Z-plastic is a key procedure. In treating vaginal septa, only the stretching effects of the Z-plastic are sought, transposition and replacement being secondary considerations.

A complete description of the operative procedure is given by the author, with excellent illustrations to supplement the text.

In all cases, it is advisable that the collaboration of a psychiatrist be sought in order to rid the patient of the psychologic disturbances created by the presence of the septum, especially the fear of sexual intercourse. This is of great importance as such disturbances become entirely unwarranted after the operation, the anatomical reason for them, the septum, having been removed.

—Ely Elliott Lazarus, M.D.

MISCELLANEOUS

Urinary Fistulas as a Complication of Radical Treatment of Carcinoma of Uterine Cervix (Contributo clinico allo studio del problema della fistole dell'apparato urinario come complicanza dell'intervento radicale per carcinoma del collo dell'utero). ALBERTO ZACUTTI. *Riv. ital. gin.*, 1958, 41: 300.

SEVEN INSTANCES of urinary fistula from the author's service at the University of Pisa in the period from 1950 to 1956 are the basis for a discussion of the pathogenesis and prophylactic treatment of this condition. In 1 patient the fistula was vesicovaginal; in 6, ureterovaginal. In 1 of the six the involvement was bilateral. These lesions occurred in 11.8 per cent of the cases operated upon, and represented 10.1 per cent of 59 cases of ureteral fistula observed by the author.

The technique used in earlier operations was that of Brenier (*Internat. Abst. Surg.*, 1952, 95: 266). Later the technique was that of Meigs as described in his book, *Surgical Treatment of Cancer of the Cervix*. In none of these cases was there any accidental injury of the ureter and in none was the ureter directly involved in the malignant process.

The most important factor in the development of urinary fistula following radical operation for carcinoma of the uterine cervix is believed to be necrosis due to interference with the blood supply of the ureter. This belief is supported by the time of appearance of the urinary leakage, as a rule not until several days following operation; by its usual localization in the juxtavesical portion of the ureteral tract; and by healing without fistula formation when the arterial supply to this area is safeguarded.

To preserve the arterial supply to the terminal portion of the ureter the round ligaments are divided and the incisions extended anteriorly to meet in front of the uterus and permit detachment of the bladder and uterus downward to the uterine artery. The ureter is identified at this point and the dissection continued posteriorly, but the ureter is permitted to remain adherent to the posterior wall of the broad ligament. In this way any arterial supply from the peritoneum can be preserved. It has been found impossible to spare the ramus coming to the ureter from the hypogastric artery, as recommended by Meigs, and the small branches originating from the cervical and vaginal arteries, but particular attention is given to preserving the blood supply of the terminal portion of the ureter from the vesical arteries, particularly that from the medial vesical artery where it branches from the uterine artery. Only limited removal of the paravesical adipose tissue in the region of the terminal portion of the ureter is carried out, so as not to injure the fine arterial rete which supplies the ureter in this region.

These improvements in technique have permitted a decrease in the incidence of urinary fistula in the last 22 cases from 15.6 per cent to 4.5 per cent.

Another consideration of importance in the pathogenesis of urinary fistula following radical operation for cancer of the uterine cervix is the degree of development and extent of the cancerous process.

The author concludes that the problem of urinary fistula following the radical Wertheim operation need no longer be considered the principal danger in the surgical treatment of carcinoma of the uterine cervix.

—John W. Brennan, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Changes in the Skin Related to Pregnancy. CHARLES A. GILPIN, JR., EDWARD A. BANNER, and R. K. WINKELMANN. *Minnesota Med.*, 1958, 41: 625.

MANY PHYSIOLOGIC CHANGES occur in the skin during pregnancy about which the physician need not be concerned. The evidence indicates that not only are pregnant women no more susceptible to dermatologic lesions but they may not even be as susceptible as are nonpregnant women, or men. The treatment of all dermatologic lesions associated with pregnancy is similar to that in the nongravid female. Only in herpes gestationis, acute and subacute lupus erythematosus, and rubella need the physician be especially concerned about the mother and the fetus.

Radiation Hazards to the Fetus. LANCE TOWNSEND. *Med. J. Australia*, 1958, 2: 289.

BY QUESTIONNAIRE it was found that of 169 children who died of leukemia, 7 per cent had been irradiated in utero. Of the children dying from leukemia in Victoria, there is only one per annum whose mother has had a roentgenographic examination during pregnancy. Each year, there are 1,000 stillbirths and neonatal deaths from other causes. It is still not proved that roentgenographic examination of the mother's abdomen causes leukemia in the baby and lack of a control series makes it impossible to prove that radiation does not cause leukemia. Great care should be taken in exposing any pregnant woman to x-rays because of the genetic risk to both mother and baby.

If information is required on medical grounds and a roentgenographic examination is the only means of obtaining it, the risk to the baby's life is greater if a roentgenographic examination is not made than it is if it subsequently develops leukemia after the examination is made. Whenever a roentgenographic examination is deemed necessary, the following precautions should be taken: (a) when the chest is examined radiologically during pregnancy the abdomen should be suitably screened, (b) no roentgenogram should be made until the eighteenth week of gestation, (c) at all times the number of exposures should be kept to a minimum and clinical methods used as much as possible, and (d) the number of films taken for roentgen pelvimetry in pregnancy should be restricted and the examination made between pregnancies whenever possible.

—Harry Fields, M.D.

Ectopic Pregnancy; An Analysis of 322 Consecutive Cases, 1935–1954. G. D. MALKASIAN JR., J. S. HUNTER JR., and W. H. REMINE. *J. Am. M. Ass.*, 1958, 168: 985.

DURING THE 20 year period 1935 through 1954, 322 ectopic pregnancies in 306 women were encountered at the Mayo Clinic. In comparing the experience in the first 10 year group with that in the second, the following factors were found to be essentially the same in the two groups: age, parity, initial complaints, incidence of abortion, the correctness of diagnosis in the pathologically proved cases of ectopic pregnancy, and the pathological diagnoses when findings were other than the clinically suspected ectopic pregnancy.

A tendency toward increasingly conservative surgery and more liberal use of blood transfusion was noted in the later group. Also noted in this group was an increased number of women having subsequent pregnancies. The maternal mortality was 0.3 per cent; no maternal deaths occurred in the last 12 years under study. The study suggests that the morbidity of appendectomy with surgical operations for ectopic pregnancy is no greater than that with abdominal hysterectomy. If dilatation and curettage had been performed on all patients suspected of having ectopic pregnancy in this series, 18 intrauterine pregnancies that later reached term would have been interrupted.

—John R. Wolff, M.D.

The Prophylaxis of Iron-Deficiency Anemia in Pregnancy. D. N. S. KERR and STANLEY DAVIDSON. *Lancet*, Lond., 1958, 2: 483.

THE INCIDENCE of anemia in pregnancy in Edinburgh in 1955 and 1956 has been estimated. Although severe anemia is rare at the beginning of pregnancy, mild anemia (hemoglobin below 12.6 grams per 100 c.c.) is common.

No correlation has been found between the incidence of anemia and age, parity, or the number of pregnancies within the previous 5 years.

An estimate of the average daily dietary intake of iron in pregnant women in Edinburgh suggests that it is slightly less than the 15 mgm. usually recommended. The incidence or degree of anemia was not found to correspond closely with the dietary intake of iron.

Oral administration of iron supplements during the third trimester corrects the anemia of pregnancy in about 80 per cent of cases, even when the initial mean corpuscular hemoglobin content is normal. This time of administration appears to be suitable for routine purposes.

With regard to gastrointestinal side-effects, no difference was found between ferrous sulphate and ferrous gluconate, given in doses containing 105 mgm. of iron daily. Neither preparation caused significantly more unpleasant gastrointestinal symptoms than the other or than the control pills containing lactose.

The addition of ascorbic acid to ferrous gluconate pills has not been shown to increase their therapeutic efficacy or to reduce their toxic effects.

—John R. Wolff, M.D.

Pelvic Hematomas Associated with Pregnancy. RAYMOND J. PIERI. *Obst. Gyn.*, 1958, 12: 249.

NINETY-FIVE cases of pelvic hematoma are reported. This represents an incidence of 1 to 742.

A pelvic hematoma is defined as any hematoma between the pelvic brim or inlet and the outer in-

tegument (skin) of the perineum. The anatomic classification of hematomas is as follows: (1) vulvar (intrafascial or superficial), below the pelvic diaphragm; (2) vaginal (suprafascial or submucous), above the pelvic diaphragm; and (3) subperitoneal (supravaginal or retroperitoneal), above Mackenrodt's (cardinal) ligaments. Trauma is the chief etiologic factor. The trauma may result from the natural forces of labor, or be produced through pressure by the advancing presenting part upon the maternal structure, especially in a primigravida. Forceps can also be the traumatic force. External fundal pressure and maltreatment of the uterus by forcible manipulation or massage may also be predisposing causative factors. Inadequate hemostasis during the course of perineal repair is another factor.

Treatment must be individualized depending on the location of the hematoma and the condition of the patient. Prompt treatment will lower the maternal morbidity and mortality from this condition.

—*Harry Fields, M.D.*

Experimental Abruptio Placentae: Histologic and Physiologic Studies. ROBERT E. L. NESBITT, JR., SAMUEL R. POWERS, JR., ANTONIO BOBA, and ARTHUR STEIN. *Obst. Gyn.*, 1958, 12: 359.

PLACENTAL ABRUPTION was produced in 35 of 44 pregnancies in 6 adult mongrel dogs by ligation of the inferior vena cava just below the renal veins, but above the right ovarian vein. Histologic studies of the uteroplacental wall and of the fetuses are described in the original article. Examination of the maternal kidneys revealed the characteristic picture of acute tubular degeneration in all of the cases.

Three pregnant dogs were subjected to direct renal blood flow studies prior to, and following, the vena caval ligation. Each animal exhibited a significant fall in renal blood flow. Since the mean aortic pressure was constant throughout each study, the fall in flow indicated an increase in renal vascular resistance.

Seven pregnant dogs subjected to ganglion blockade with trimethaphan camphorsulfonate (arfonad) at the time of the vena caval ligation demonstrated a reduced incidence of placental abruption, as well as a reduction in the degree of separation and retroplacental bleeding, when compared with the untreated group of animals. In all instances, the kidneys from this group of animals were clinically and histologically within normal limits.

Arfonad will limit markedly the rise in venous pressure which occurs following venous occlusion. After vena caval ligation the caval pressure rises dramatically and stabilizes at a fairly high level over a one-hour period. The administration of arfonad at this time caused an immediate fall in arterial pressure, but more important, the venous pressure fell abruptly to reach the base line of continued caval occlusion.

These experiments would seem to incriminate elevated venous pressure as one possible factor in the pathogenesis of placental abruption, and when this pressure is reduced by means of autonomic blockade, the chain of pathologic events, both locally and systemically, is favorably modified. Possible mechanisms of production of placental abruption have been discussed.

The lower incidence of renal damage in arfonad-treated animals may be attributed, in part, to the presence of only minor degrees of placental abruption, but the finding of normal kidneys in all treated animals suggests that a specific protective action on the renal tubules occurred. Experimental evidence has been presented to support this thesis.

—*John Wolff, M.D.*

LABOR AND ITS COMPLICATIONS

The Etiology and Diagnosis of the Unengaged Head (Zur Aetiologie und Diagnostik des hohen Gradstandes). H. KIRCHHOFF. *Deut. med. Wschr.*, 1958, 83: 1651.

THE HIGH-LYING, or unengaged, head at the onset of labor is quite uncommon. In the experience of the author this complication was found on 42 occasions among 5,960 births (0.7 per cent). The causes usually mentioned in the literature include abnormal placental site, uterine deformities, fibromyomas, forelying small parts, and fetal malformations. In the author's opinion the two most important factors are the shape of the fetal head and the form of the maternal pelvis. Of most significance is the long, or anthropoid, pelvis. This type of pelvis predisposes both to a high fetal head at the beginning of labor and to a posterior position.

The diagnosis of an unengaged head should easily be made by the obstetrically minded physician. Overriding of the head can be determined abdominally and confirmed by internal examination. The third obstetric maneuver of Leopold is still valid. External measurements give very little indication of the internal size of the pelvis itself. The fetal heart tones are often heard anteriorly in the midline or in the flanks, and indicate a direct occiput anterior position or posterior position, respectively.

An unengaged head before labor requires special attention during labor and the patients should be observed carefully. If the head does not enter the pelvic cavity under the influence of strong uterine contractions then cesarean section should be considered; this is necessary in about 4 of every 5 cases.

—*Warren R. Lang, M.D.*

The Assessment of the Cervix at Surgical Induction. W. A. W. DUTTON. *Canad. M. Ass. J.*, 1958, 79: 463.

IT IS GENERALLY ACCEPTED that the success of an induction is dependent upon the ripeness of the cervix. The condition of the cervix was assessed before 274 surgical inductions. The cervixes were classified into six types. Types 1 and 2 were considered ripe and Types 3, 4, 5, and 6 are unripe. The subsequent performance of the cases was studied in relation to the patients' age and parity, the gestation period, the character and volume of liquor removed, the position of the presenting part, the type of induction, and the primary indication for the induction.

It was found that only the initial condition of the cervix and type of induction had any great influence on the outcome. The performance of the cases with a ripe cervix was significantly better than those with an unripe cervix. The incidence of abnormal uterine action was significantly greater in the cases with an

unripe cervix (15.2 per cent) than in the cases with a ripe cervix (0.9 per cent). There was no evidence that cases with an unripe cervix were more likely to require operative delivery provided uterine action was normal.

The efficiency of forewater rupture over hindwater puncture was demonstrated in the cases with a ripe cervix, but was not demonstrated in the cases with an unripe cervix. Other reasons were advanced in favor of forewater rupture.

It is suggested that the procedure of carefully assessing the cervix may influence the decision regarding induction, can be of general assistance in formulating a prognosis, and may help in the evaluation of individual cases. —*Harry Fields, M.D.*

Report on 1,377 Cesarean Sections During the Years 1937 to 1956 (Bericht ueber 1,377 Kaiserschnitte unserer Klinik aus den Jahren 1937–1956). LUTWIN BECK and HELMUT HILLEJAN. *Geburtsh. & Frauenh.*, 1958, 18: 1098.

DURING THE LAST 20 YEARS the operative mortality of cesarean sections in Germany has decreased from a high figure of 5.3 per cent just before the war to well below 1 per cent in recent years. During this period 1,377 abdominal deliveries were accomplished at the Rhineland Women's Clinic Wuppertal-Elberfeld, an incidence of 3.5 per cent of all deliveries.

The fact that a fetal indication for cesarean section is much more acceptable today accounts for the threefold increase in placenta previa and premature separation of the placenta in this material. Disproportion has decreased very much in importance due to better recognition and management of uterine dystocia, while sections for anomalies of presentation, engagement, and labor have doubled. Eclampsia as an indication is no longer significant, but late nonresponding pre-eclampsia leads to section much more frequently. The increasing safety of the procedure has made it acceptable to extend its benefits to such indications as sustained fetal depression and prolonged labor in elderly primiparas.

Anesthesia in recent years consisted predominantly in peridural block (66.7 per cent), spinal or saddle block (25.5 per cent), and phenothiacin-barbiturate-nitrous oxide anesthesia, with or without intubation (4.2 per cent). Pentothal ether and local anesthesia are rarely employed any more. The operative technique consists of the Pfannenstiel incision, low transverse uterine incision, and two layers of uterine sutures.

Cesarean hysterectomy was necessary in 26 cases and "resection" (defundectomy) in 15 per cent of the sections. The corrected maternal mortality has decreased from 1.1 per cent in the period from 1937 to 1946 to 0.36 per cent in that of 1952 to 1956. Of the 20 deaths in the total period, 5 were due to cardiac decompensation, 5 to postoperative peritonitis (4 of these before 1944), 3 to peridural anesthesia, 2 to eclampsia and severe pre-eclampsia, 2 to chronic nephritis and uremic coma, 2 to severe hemorrhage, and one to circulatory collapse.

The average hospitalization of these patients was 16 days and 80 per cent had an uncomplicated course. One case each of ureterocervical and cystovaginal fistula was reported. Fetal mortality has decreased from 9.3 per cent (1937 to 1951) to 6.4 per cent (uncorrected) in 1956, mainly because of increased salvage of premature infants. The fetal hazards and the "delayed respiratory distress syndrome" are thoroughly discussed, and the question comes up again as to whether a cesarean section for fetal indication might not add a new hazard to the baby.

—*W. Dieter Bergman, M.D.*

NEWBORN

Subcapsular Hematoma of the Liver in the Newborn (L'ematoma sottocapsulare del fegato nel neonato). T. DI GIULIO and E. MASDEA. *Clin. ostet. gin.*, 1958, 60: 131.

SUBCAPSULAR HEMATOMA has never been diagnosed in the newborn although the finding of a ruptured angioma at autopsy has been reported five times in the literature. The authors describe a sixth case which occurred in a boy, weighing 3,800 gm., who was delivered of a 21 year old woman by forceps. Albuminuria and premature rupture of the membranes were noted in the mother. The boy died practically symptomless 20 hours after birth. (The authors give no further clinical details.)

At autopsy general anemia, pulmonary atelectasis, and hemoperitoneum were found. There was a ruptured subcapsular hematoma on the posterior surface of the right lobe of the liver.

The child died of exsanguination. The authors explain the hematoma as a possible result of hemorrhagic diathesis. Nevertheless, trauma was considered as the immediate cause of the rupture.

Preventive treatment is not known at the present time. —*George Sillő, M.D.*

MISCELLANEOUS

Chronic Pyelonephritis and Pre-Eclampsia (Chronische Pyelonephritis und Präeklampsie). E. HOCHULI and O. KÄSER. *Geburtsh. & Frauenh.*, 1958, 18: 1132.

CHRONIC PYELONEPHRITIS is without doubt the most common chronic kidney disease; it is responsible for more than half of all the uremias, and is present in about 5 per cent of all autopsies (Raaschou). The Escherichia coli seems to be the principal offending organism in 80 per cent of the cases, and the infection may spread by hematogenous, lymphogenous, or canalicular routes. The parenchyma of the kidney is so frequently involved that the term "pyelitis" or "cystopyelitis" is nearly always a misnomer. Evidence of pre-existing pyelonephritis in pre-eclampsia reported in different articles varies from 2 to 20 per cent. In one series of 28 posteclamptic patients, pre-existing renal or vascular disease was found in more than one-half of the patients, significantly limited to one kidney (always the right one) in the majority of cases (Hochuli).

In the total number of 7,170 deliveries at the St. Gallen Women's Clinic in the years from 1953 to 1957, the authors found 258 instances of severe pre-eclampsia, an incidence of 3.6 per cent. Of these 258 patients, 104 could be re-examined 3 months to 5 years after recovery from toxemia, and 17 were found to have definite, and 10 probable, chronic pyelonephritis, an incidence ranging from 16.3 to 25.9 per

cent. Three of these patients had granular kidneys, and 2 had granular kidneys with associated malformations. Some of the cases are described in detail with roentgen films and tabulated data.

In most of the 17 cases repeated pyelitis of pregnancy was noted in the history, while kidney infections during early childhood were indicated in a few other cases. Since regeneration after pre-eclamptic renal damage may require many months, there will necessarily be a long delay in determining pre-existing disease. Routine clinical evaluation is not exact enough to establish the diagnosis, and a whole armamentarium of x-ray and laboratory tests, including clearance, determination of xanthoproteins, and the phenol red test, in addition to routine blood chemistry, may have to be utilized. Of particular importance is the early recognition of chronic kidney damage and strict treatment of all primary or superimposed episodes of genitourinary infection.

—*W. Dieter Bergman, M.D.*

Injuries to the Sacral Plexus in Obstetrics. W. G. Whittaker. *Canad. M. Ass. J.*, 1958, 79: 622.

Fourteen cases of peripheral nerve injury due to obstetrical trauma and resulting in foot drop are reviewed. The anatomical background is described and the mechanism of injury suggested. The injury is to the upper roots of the sacral plexus, usually without disruption of the nerve axis. It is estimated that the incidence of some form of nerve injury may be about one in 2,000 deliveries. Since minor nerve trauma is transient in nature and often overlooked, the frequency with which paralysis and sensory disturbances are clinically recognized in the puerperium must be about 1 in 5,000 deliveries. Clinical features peculiar to obstetrical palsies are disproportion, prolonged labor, difficult delivery, and instrumentation. It is suggested that injury to the pelvic nerve may be caused by obstetrical forceps during difficult midpelvic operations. Other mechanisms may also produce trunk injury. For instance, a large fetal head in the brim or rotating in the midpelvis may produce a compression injury or vascular stasis and subsequent anoxic injury to the nerve trunk. It is known that edema and inflammation of the tissues around the nerve may produce temporary dysfunction of the nerve. Primiparas with large babies necessitating difficult midforceps delivery are likely to have this peripheral nerve complication.

Although the prognosis is guarded, recovery from foot drop is usually complete in about 3 to 4 months, when the latter is managed simply with a foot drop brace. When there has been moderate nerve injury in a previous pregnancy, it is believed that cesarean section should be considered in subsequent pregnancies, unless the infant is small. There should be no question of a trial of forceps on a patient whose previous obstetrical history suggests traumatic lumbosacral trunk palsy.

—*Harry Fields, M.D.*

Some Morphological Aspects of the Adaptive Crisis of the Hematosis in the Newborn (Quelques aspects morphologiques de la crise adaptive de l'hématose néonatale). R. Parmentier. *Bull. Soc. Roy. belg. gyn. obst.*, 1958, 28: 104.

The author describes the histology of the three important stages of the development of the fetal lungs. He insists especially on the unfolding of the alveoli and discusses the theories explaining it. He favors the hemodynamic theory, according to which the increased pressure of the pulmonal circulation through a capillary erection causes the alveoli to unfold and enables them to insure the hematosis of the newborn.

After giving a short description of the fetal circulation, the author discusses the histology of the pulmonary vessels and insists on the structural analogy between the transitional pulmonary arteries and the ductus arteriosus.

He describes the stages in adaptation of the circulation by the newborn, the disappearance of the connecting system with the circulation of the placenta, the closure of the foramen Botalli and ductus arteriosus, and the opening of a third "lock" represented by a vasoregulating rôle taken by the transitional pulmonary arteries.

He insists that the closure of the ductus arteriosus is due to an active contraction of the wall of the vessel and influenced by the saturation of oxygen of the fetal blood.

In conclusion the author considers the respective importance of the epithelial component of the fetal lung, essential for the embryological development, and of the vascular component, essential for the formation of the alveoli.

The unfolding of the alveoli is the culminant point of the pulmonary histogenesis, and is connected with the separation of the two circulations (the closing of the ductus arteriosus and the foramen Botalli, and the adjustment of the capillary pressure in the alveoli), which seems to be the most important factor causing the alveoli to unfold.

—*J. C. Mulier, M.D.*

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Adrenalectomy in Cushing's Syndrome. A. STUART MASON and J. E. RICHARDSON. *Lancet*, Lond., 1958, 2: 649.

CUSHING'S SYNDROME is a progressive fatal disease with an average duration of 5 years. The metabolic disturbance is due to excessive secretion of adrenocortical hormones. The anatomical lesion may be a tumor or bilateral hyperplasia of the adrenal glands. Preoperative and postoperative studies have been made on 17 patients with Cushing's syndrome, associated with bilateral adrenal hyperplasia, and one case of adrenal carcinoma. The diagnosis and the progressiveness of the disease must be established beyond a doubt before surgery is undertaken. The diagnosis requires investigation of the disorder of function and of the anatomical lesion. The physiologic disturbance is apparent from the clinical features. The effect of increased protein catabolism can be directly estimated by the nitrogen balance. Associated metabolic changes can be detected equally by the glucose-tolerance test and radiographic examination of bones for evidence of osteoporosis. The electrolytic disturbance must be investigated by the estimation of the serum sodium, chloride, potassium, and bicarbonate.

Estimation of the urinary 17-ketosteroids revealed raised values in all of the authors' cases of Cushing's syndrome. However, this level may be increased, decreased, or normal in this syndrome and inasmuch as the excretion of all steroids is subject to considerable variation in Cushing's syndrome, the estimation should be made on several 24 hour collections of urine. In this group, the authors have relied on straight roentgen examination and tomography, combined with intravenous pyelography to outline the position of the kidney. A large proportion of tumors can be detected by this means. The final decision about the anatomical lesion is made at operation. In hyperplasia both glands are enlarged. If a functioning tumor is present the opposite gland undergoes atrophy. The type of lesion can therefore be determined when the first gland is exposed. The appearance of the tumor is obvious on inspection. If the gland is large, but no tumor present, it can be assumed that hyperplasia is the cause; if it is small it must be left and the opposite side explored.

The clinical appearances of the patients are related to factors which may vary independently. Thus, the severity of muscle wasting depends on duration rather than on the level of negative nitrogen balance. Repletion of the protein stores and the stimulation of anabolism is extremely difficult in the presence of Cushing's syndrome. Impaired sugar tolerance is a characteristic feature, and its assessment has some value in diagnosis. It is in part related to protein catabolism, and in part to the antagonism between hydrocortisone and insulin. Disturbances in the electrolytic balance may be present and must be corrected before operation.

In the younger patients and in those with rapidly progressive disease, total adrenalectomy is recommended. In older patients subtotal adrenalectomy is preferred. In the younger patients the operation is carried out in one stage, and in the older patients in two stages. The most important item in the immediate preparation for surgery is the administration of sufficient cortisone to maintain the excessive level of glucocorticoids to which the patient has become accustomed, and after operation the dose must be adjusted so that reduction to normal levels is gradual and controlled. To insure absorption over the time of operation and during the postoperative period the cortisone must be given intramuscularly. Intake of water and sodium must be limited in the immediate postoperative period. The dose of cortisone must be gradually reduced, and later the amount of salt increased. The most serious postoperative complication is acute adrenal failure, and is due to inadequate cortisone therapy before and immediately after operation. A possible contributory factor is excessive water intake which should be treated by hydrocortisone hemisuccinate, given intravenously. The other complications are ileus, pulmonary embolism, hemothorax, and pneumothorax.

Studies of the metabolic status of the patients, postoperatively, revealed that measurement of the serum levels gave no accurate indication of the electrolyte balance. There is no need to administer additional mineralocorticoids. The daily intake of sodium, either intravenously or by mouth, should not exceed 140 mEq. daily. The amount of water given intravenously and by mouth during the first 2 to 3 days after operation should not exceed the urine volume by more than 1 to 1.5 liters daily. These observations apply to the initial phase, postoperatively, of sodium and water retention. In the later period the patient requires a high salt intake if the electrolytic balance is to be maintained with hydrocortisone therapy, and some patients will require, not only cortisone, but continued administration of mineralocorticoid.

—Robert O. Beadles, M.D.

Sodium Depletion in Adrenalectomized Human Beings. MORTIMER B. LIPSETT and OLOF H. PEARSON. *J. Clin. Invest.*, 1958, 37: 1394.

THE EFFICIENT RENAL CONSERVATION of sodium promoted by aldosterone precludes the development of sodium deficiency via urinary excretion. However, this can easily be obtained in adrenalectomized patients receiving maintenance doses of cortisone.

Studies were carried out on 6 patients, 5 of whom had had adrenalectomy, and the sixth had classical Addison's disease. All had normal renal function. They were placed on a low salt diet (6 to 15 mEq. of sodium daily) supplemented with weighed amounts of sodium chloride during the periods of normal salt intake. Water intake was uncontrolled. Each subject was fed the same lot of food throughout the study, and the sodium and potassium content of rejected food

was calculated. The dosage of cortisone acetate was constant throughout the experiment. From these studies it seems that in the presence of a depleted total body sodium, small additional losses can rapidly lead to severe hyponatremia. When this occurs about 50 per cent of the total exchangeable sodium has been lost. This situation is the prototype of the spontaneous development of the hyponatremic crisis of Addison's disease.

In addition to the amount of sodium depletion necessary to produce hyponatremia, the rate of salt loss may also influence the degree of hyponatremia and the severity of clinical manifestations. The loss of salt is accompanied by the loss of water, so that the fluid lost during the initial stages of salt depletion is essentially extracellular fluid. With further depletion, volume requirements are somehow "sensed" and water is retained relative to the salt, which results in hyponatremia.

The development of the hyponatremia was shown to occur in the absence of antidiuretic hormone, and the relative water retention which must occur as hyponatremia develops was related to the marked decrease in glomerular filtration rate. When salt was returned to these patients, the immediate clinical results were dramatic. During the first day, the patients spontaneously volunteered that cramps had disappeared, dizziness was gone, and appetite had returned. An elevation of the blood urea nitrogen (BUN) or nonprotein nitrogen (NPN) has been observed in all studies of salt depletion. Thus, this finding should be important in the differential diagnosis of hyponatremia. A normal serum BUN or NPN, in the presence of severe hyponatremia, effectively rules out sodium depletion as the cause of the hyponatremia.

The converse, however, is not necessarily true. A patient with poor kidney function may develop dilution hyponatremia. The algebraic difference between predicted cation balance and the observed cation balance is recorded. Calculations were made at various intervals during periods of sodium depletion and repletion, as well as for the entire period. Less cation was retained than that predicted. Similarly, a comparison of the observed serum cation concentration with that calculated for the end of the depletion period, showed a marked discrepancy in each case. These data support the suggestion that, under appropriate circumstances, either inactivation of intracellular cation or differences between intracellular and extracellular tonicity can be demonstrated.

—*Robert O. Beadles, M.D.*

Perirenal Hematoma Communicating with the Excretory Tract (Ematoma perirenale aperto nelle vie escretrici). G. Sesia. *Boll. Soc. piemont. chir.*, 1958, 28: 367.

The author reports the case of a 77 year old single woman who was hospitalized because of a left flank pain which had begun one month before and become steadily worse. There were no fever, dysuria, or gross changes in the appearance of the urine. Her nutritional state was fair. The abdomen was soft and nontender. The inferior pole of the left kidney was rather fixed and tender. The blood pressure was 200/70. The results of laboratory tests were within normal limits. An intravenous urogram revealed no evidence of function in the left kidney. Left retrograde urography revealed stenosis at the level of the ureteropelvic junction, dilatation of the calyces, and the presence of opaque material outside the renal pelvis in the peripelvic tissues. Surgical exploration of the left kidney revealed thickening and induration of the perirenal tissues. A nephrectomy was performed in view of the uncertain nature of the lesion. Pathologic examination revealed perirenal sclerolipomatosis and a retracted scarred area on the posterior upper surface of the kidney. A sagittal section showed a smoothly lined cavity around the renal pelvis communicating with the upper left calyx, a few small organizing periureteral hematomas, as well as a parenchymal hemorrhagic cyst.

Spontaneous perirenal hematomas are rather rare, however, the author believes that the age of the patient and the longstanding hypertension favored the occurrence of a vascular accident. The scar noted on the surface of the kidney was that of a typical renal infarct, probably followed later by perirenal extension of the hematoma, organization, cystic changes, and finally emptying into the excretory tract through the upper calyx. This case differs from others reported, with similar pathologic findings, because of the rather mild though progressively increasing symptoms, and the absence of any historical data suggesting a previous renal vascular accident.

—*Franco F. Sangalli, M.D.*

The Operative Fixation of Floating Kidney (Zur operativen Befestigung der Wanderniere). Dimiter Sarafoff. *Urologia*, 1958, 25: 142.

In a series of 71 patients with mobile kidneys operated upon during the past 20 years by the author's method of renal fixation there have been no recurrences. The patients have consistently gained weight, have had no untoward symptoms, and have been able to carry on their avocations without interruption. In the cases in which a postoperative examination of the kidney could be carried out, the replaced organ was found in a normal position, with disappearance of any hydronephrosis which may have been present, and with apparently normal function.

The kidney is exposed through a short incision parallel to and 3 cm. below the twelfth rib. The quadratus lumborum muscle is divided along the same line without displacing the lumbodorsal fascia and without injuring the important nerves. The perirenal fascia and fat are removed (in these more or less emaciated patients there is little perirenal fat and the fascia is loose and flaccid) and the anterior and posterior surfaces of the kidney are bared as far as the hilus. The fascial covering of the quadratus lumborum and psoas muscles is also removed over the renal bed.

The kidney is turned upward over the upper edge of the abdominal incision and its posterior fibrous capsule removed. The lower portion of the capsule is rolled up on itself to form a shelf along the lower renal border and fixed with a few catgut sutures. The raw posterior surface of the kidney is applied to the raw surfaces of the quadratus lumborum and psoas muscles. The kidney is in a normal position, about two-thirds above and one-third below the lower edge of

the twelfth rib. The ureter is straightened, but not under tension.

A tonguelike flap of muscle with its base directed upward is prepared from the anterior surface of the quadratus muscle, lateral to the raw area, or from the lateral wall of the abdomen. It is brought forward and sutured to the shelf of renal capsule; the excess is brought snugly up to the anterior surface of the kidney and sutured there. The muscle flap acts like the hollow of the hand in supporting the kidney and obliterates the lower portion of the perirenal space.

The patient is kept supine with the foot of the bed elevated for a week.

The author originally published this method in 1942. Since then other workers, notably G. W. Heise (Internat. Abst. Surg., 1958, 107, 481), have described the same procedure, apparently without knowledge of his publication. These workers have also reported good results.

—*John W. Brennan, M.D.*

Hypertension Due to Unilateral Renal Arterial Obstruction: Preliminary Observations on the Contribution of Differential Renal Clearance Studies. ROBERT BIRCHALL, HUGH M. BATSON, and CHARLES B. MOORE. *Am. Heart J.*, 1958, 56: 616.

THE AUTHORS believe that the theory that severe arterial hypertension can be caused by any lesion that impairs the blood supply to one kidney has now been well documented. They point out that surgical exploration is justified if a definite lesion can be demonstrated by carefully performed and interpreted aortography. They have experienced difficulty, however, in interpreting films in which stenosis is questionable, and have twice found, at operation, that accurate measurement of the arterial pressure proximal and distal to the stenosis revealed no significant lowering of pressure below the stenosis. They turned to differential renal function studies as a more sensitive test to complement aortography. For such studies they selected patients (1) whose hypertension began before the age of 30 years, (2) whose hypertension began after the age of 50 years, particularly if it accelerated rapidly, (3) with fixed arterial hypertension and an audible bruit over one or both femoral arteries, (4) with unexplained difference in size and function of the two kidneys on excretory urography, (5) with a kidney which appeared to be nonfunctioning on excretory urography and normal on retrograde pyelography, (6) whose hypertension suddenly became more severe, and (7) whose history seemed in some way at variance with what experience would lead one to expect.

The following procedure was used on 5 patients. All received 1,000 ml. of water in the hour preceding the test, which was supplemented, in one instance in which urinary flow was inadequate, by the intravenous administration of one liter of 5 per cent solution of dextrose in distilled water. Sedation was achieved by means of sodium luminal, morphine sulfate, nisentil and lidocaine hydrochloride or piperocaine hydrochloride. Cystoscopy was performed and a No. 6 or 7 whistle-tip ureteral catheter was inserted into each ureter. When urine was demonstrated to flow freely from each catheter, the cystoscope was removed and a No. 16 Coude catheter was inserted into the bladder. Urine was obtained from each catheter for determination of the inulin blank. A blood sample was collected for determination of the inulin and para-aminohippuric (PAH) blank. A priming infusion of PAH and inulin was then started, followed by a sustaining infusion calculated to maintain a plasma level of 15 to 20 mgm. per cent of inulin and 2 to 3 mgm. per cent of PAH. Forty-five minutes were allowed for equilibration and the test was begun. Standard clearance procedures were used.

The results of these studies are shown in a table in the original article. Two patients had renal function equal on each side, 2 others were proved to have renal arterial obstruction, and the last had hypertension associated with unilateral atrophic pyelonephritis. A summary of the authors' observations is given in another table, which represents a comparison of the results of clearance studies on the kidney with unobstructed blood flow (considered as the "hypertensive" kidney) and the affected kidney (considered as the "hypotensive" kidney). The data indicate that the combination of a decreased urine flow and an increased U/P-inulin ratio on one side may prove to be diagnostic of the presence of unilateral renal arterial obstruction.

Finally, aortography is capable of producing severe renal arteriolar spasm with over-all depression of the renal function and a high filtration fraction which may persist for as long as 3 days. Consequently, differential renal clearance studies should be performed before aortography, and operation should be postponed at least 3 days after aortography.

—*Laurence F. Greene, M.D.*

Thrombosis of the Renal Veins; A Case Report (Ein Fall von doppelseitiger Thrombose der Vena Renalis). KYRILL PAWLOFF and LÜBOMIR BABINOFF. *Urologia*, 1958, 25: 274.

A CASE of bilateral renal vein thrombosis occurring in a 52 year old male with a history of chronic renal difficulty is described. The patient was hospitalized twice (in 1952 and 1956) before the present illness. On both occasions there was mild proteinuria, few red and white blood cells, and some hyaline casts in the sediment; the concentration test was normal; the blood pressure 140/95; and there was occasional puffiness of the eyelids. At the last hospitalization (1957) the blood urea nitrogen was 26 mgm. per cent. The serum proteins were within normal limits, but with a reversed albumin globulin ratio due to an increase of the α 2 globulin fraction. The urinary findings were unchanged from the previous examinations. At this time the patient presented chills and fever associated with swelling in the right leg.

Treatment with antibiotics was started, but in spite of this the general condition of the patient became progressively worse and he died as a result of anuria and uremia.

On clinical grounds two possible diagnoses were made: (1) chronic nephrosis-nephritis without renal impairment and hypertension, and with proteinuria; and (2) acute thrombophlebitis with embolism of the renal vein. At autopsy two anemic infarcts were present in the left kidney. Both renal veins and their

major branches were filled with fresh thrombotic material adherent to the wall. There was also a thrombosis of the femoral vein for 10 cm. below the inguinal ligament and of the external and common iliac veins. The inferior vena cava was thrombosed 1 to 0.5 cm. above its junction with the renal veins. Histologically, the kidneys presented interstitial nephritis with some glomerulosclerosis. Fresh thrombi were seen in the renal vessels. There was also a prostatic adenoma with prostatitis. The authors believe that the renal shutdown was due to renal thrombophlebitis, which was probably secondary to the thrombophlebitic changes found in the femoral veins.

—*Riccardo Benvenuto, M.D.*

Survival of the Excised Dog Kidney Perfused in a Pump-Oxygenator System. Circulatory Changes in the Hypothermic Preparation. NATHAN P. COUCH, GORDON F. CASSIE, and JOSEPH E. MURRAY. *Surgery*, 1958, 44: 666.

THE PRESENT STUDIES comprise the first phase of the authors' efforts to sustain viability in excised kidneys for extended periods without passage of the perfusing blood through the lung tissue. They were planned to determine the survival time of such preparations and to document some of the hemodynamic and functional factors associated with failure.

By the method described, 18 dog kidneys were perfused in a siliconized glass and Tygon system, at a temperature of 25 degrees C, with heparinized, oxygenated autologous whole blood which was not passed through an animal lung with the perfusate. With simple diluents, including normal saline and Locke's solutions, it was possible to maintain urine production for periods of about 7 hours. Although it cannot be stated that abnormal function indicates inadequate viability for storage purposes, it was thought that these preparations can be improved upon with the aim of achieving survival for unlimited periods. When the excised kidney was perfused with whole blood alone, there was a precipitous decline of blood flow during the first 10 minutes, which indicated that the factors responsible were present in the system initially and were rapidly acting. The pattern of a fast decrease of flow followed by a slower period of decline suggests the presence of two or possibly more agencies. It is possible that the gain of tissue fluid completed a self-perpetuating cycle wherein the decreased blood flow enhanced the vascular and tissue anoxia, and thus increased vascular permeability and tissue pressure. In addition to the factors of vasoconstriction and increased tissue pressure, mechanical obstruction of the minute vessels by thrombi and sludged red cells was also implicated and was confirmed histologically in several of the kidneys.

In the present perfused kidneys, saline infusion was followed by an increased renal blood flow, an increased creatinine clearance, and an increased creatinine filtration fraction. The increased creatinine clearance was due chiefly to the increase of renal plasma flow and to a decrease of the colloidal osmotic pressure. The low levels of creatinine urine in relation to the plasma ration indicated that the tubular capacity for water reabsorption was markedly reduced.

—*Robert O. Beadles, M.D.*

BLADDER, URETHRA, AND PENIS

Cystourethrography in Stress Incontinence. PER AGNAR NILSEN. *Acta obst. gyn. scand.*, 1958, 37: 269.

CONSIDERING our meager knowledge of the mechanism of normal micturition it is not surprising that we are ignorant of the mechanisms involved in stress incontinence.

In recent years many roentgenographic investigations have been carried out in order to find the characteristic changes of stress incontinence. There has been some variation in the results obtained, partly because of variations in the methods of examination. Some investigators have taken anteroposterior views only, while others have taken oblique and lateral views. At times the bladder alone has been filled with contrast media, and in other cases the urethra has also been filled. Other differences may be due to variations in the position, with the patient either recumbent or erect, or to examinations during straining or actual micturition.

Among recent investigators, Jeffcoate and Roberts (1952) found that in stress incontinence the bladder neck descended when the patient strained, the proximal part of the urethra assumed a funnel shape, and the posterior vesicourethral angle disappeared. For the latter finding, which is the most persistent, lateral roentgenograms are needed. Stress incontinence is present if the angle disappears at any other time than during micturition itself. Hodgkinson in 1953, using metal beads to mark the urethra, and lateral roentgenograms, regarded as characteristic features of stress incontinence the formation of a funnel shape of the bladder when the patient strained and simultaneous downward descent of the bladder base, the internal urinary meatus being furthest depressed.

The authors present studies that have been carried out since 1952 in 100 patients with stress incontinence. Anteroposterior and lateral roentgenograms were taken with the patients at rest, during micturition, during a "hold" phase, and, in a majority, also while straining. A suspension of barium sulphate in water in the proportion of 3 to 1 was used as a contrast medium. The urethra was marked with a flexible and mobile chain of metal beads inserted by a fine probe. This procedure reproduced the shape of the urethra without distorting it. By using a simple plastic bag suspended between the legs and tied about the waist the patient could stand in front of the x-ray screen and micturate into the bag.

A common feature of all previous investigations is that the important changes were described as occurring at the bladder neck, i.e., the transition between bladder and urethra. The most frequent abnormality found in this study was funnel shape of the bladder neck which was best demonstrated on the lateral roentgenogram. The lowest part of the funnel is always the internal urinary meatus except when cystocele exists. The second most frequent change is loss of the posterior vesicourethral angle. In the normal continent patient the bladder has a horizontal lower border and the anteroposterior view shows the urethral shadow at a 90 degree angle. A good angle also is seen in the lateral view. In the incontinent patient the posterior angle is more than 180 degrees.

Although Jeffcoate reported loss of the posterior angle in their incontinent patients during micturition, there was a definite posterior angle in several patients in this series.

Postoperative cystourethrograms after successful operations show less excursion of the bladder during straining and micturition because of more solid support. The posterior urethrovesical angle is restored even during micturition, more marked in some procedures.

Several case histories are presented and the accompanying roentgenograms and diagrams support the text. —*Allan K. Swersie, M.D.*

The Complications of Urethral Stricture. A. MARSHALL. *Brit. J. Urol.*, 1958, 30: 348.

DESPITE modern chemotherapy and antibiotics, urethral stricture remains an important proportion of the conditions observed in urologic outpatient departments. The author reviews the literature and discusses the complications as well as the factors influencing these complications.

One hundred forty-six patients with urethral strictures who were seen in an 18 month period were studied. Their ages ranged from 22 to 82 years. The strictures were located in all parts of the urethra. The causative factors were tabulated as follows:

Postinfective 73%
External trauma 12%
Following prostatectomy 10%
Following urethral calculus 2.8%
Congenital 1.4%
Tuberculosis 0.8%

Each patient was studied by intravenous urography, and determination of the blood urea. Postvoiding cystograms were checked for residual urine and urinalyses and cultures of the urine were obtained. Almost all of the patients had urethrograms.

Abnormal findings revealed by the roentgenograms are of interest. The kidney and ureter were affected in about 19 per cent of cases, the bladder in 32 per cent, and the prostate in 47 per cent. It is of interest to note that a roentgen diagnosis of chronic prostatitis was made if the prostatic ducts permitted entrance of dye during urethrography.

A fairly close parallel was found in this series, as well as in the literature, to hernias, hemorrhoids, and stricture; this was apparently a result of the need for increased intra-abdominal pressure to urinate.

With regard to the end results of treatment, about 80 per cent were benefited by surgery and 77 per cent improved by dilatation alone.

The most important complication is, of course, involvement of the kidney with impairment of renal function.

The author suggests that plastic surgical procedures to reconstruct the urethra may be indicated as a method of treatment in all classes of strictures except very wide strictures, which require only yearly dilatation. This represents an effort to reduce the high incidence of complications. Whether or not this would be a satisfactory answer depends on the follow-up study of some of the more recent plastic procedures which have been described.

—*John F. Herman, M.D.*

GENITAL ORGANS

Chronic Vesiculoprostatitis—A Reorientation. A. J. LEADER. *J. Am. M. Ass.*, 1958, 168: 995.

THIS VERY COMMON clinical entity is classically defined as a pyogenic infection of the prostate and seminal vesicles characteristically presenting a symptomatology of backache, a tired feeling, and pain in the groins or suprapubic area. A sense of perineal fullness and/or aching in the testicles is also a frequent complaint. Careful history taking almost always reveals a history of some sexual difficulties; either failing "sexual powers," premature ejaculation, or impotence and loss of libido. There is occasionally a mucoid urethral discharge in the morning. Urinary symptoms are not common although a urethral "itching" sensation is sometimes remarked. The diagnosis of this syndrome is based on the history and the symptoms as well as the rectal findings of a boggy prostate and palpable seminal vesicles. Prostatic massage with expression of large quantities of secretion followed by a good therapeutic response to this decongestion is almost pathognomonic of this condition.

The purpose of this article is to establish the fact that the etiology of this syndrome is stasis rather than infection. Although it is generally believed that the disease is due to infection, it has long been known that only occasionally is the clinical diagnosis supported by laboratory evidence. In most instances, cultures of the prostate and vesicular secretions show no growth, and the finding of pus cells in the fluid from the prostate is not sufficient to substantiate the diagnosis of prostatitis. Histopathologic changes of inflammation have not often been observed to correlate with this entity, and the sulfa drugs and antibiotics have failed to alter the course of the disease as might be expected in true pyogenic infections. Conversely, relief of symptoms follows local massage and drainage in a high percentage of cases. From the foregoing it seems reasonable to believe that what is basically involved is a functional inability of the prostate and seminal vesicles to empty themselves of their secretions. This inability would, in all likelihood, give rise to congestive inflammatory changes responsible for the symptoms and physical findings characteristic of the disease.

The author suggests that marital sexual maladjustment is the usual cause of this condition. A deep sympathy and understanding and a logical explanation of what has happened to cause the symptoms, are all of therapeutic value.

The author also suggests that the term "vesiculoprostatitis" for the disease entity should be dropped and a new term, "vesiculoprostatostasis," be adopted.

—*John F. Herman, M.D.*

Urinary Steroid Excretion and Other Biochemical Indexes in Prostatic Cancer in Relation to Therapy. HERNAN ACEVEDO, CARLOS LOBO-ONELL, and JUAN ZAÑARTU. *Cancer*, 1958, 11: 1003.

MEDICAL THERAPY of prostatic carcinoma is aimed at reducing the patient's androgen production. This therapy is usually carried out and no proof has been offered that any one estrogen is better than another. Relapse from treatment is not due to habituation with one particular brand of estrogen, but most probably it is

associated with increased production of adrenocortical hormones. Thus, the authors thought that measurement of urinary steroid catabolites would provide an objective means of following the patient's response to therapy.

Therefore, they instituted a study of the urinary 17-ketosteroid ketonic fractions and of the urinary 17-ketogenic steroids in several series of patients with prostatic carcinomas. Several patients were studied for longer periods and their clinical course evaluated with their urinary steroid excretions.

The authors' studies revealed that untreated patients with prostatic carcinoma with or without metastases had normal production of urinary steroids. In castrated patients, there was at least a temporary reduction of the urinary hormonal output, although it still remained within normal levels. The reduction could only be recognized in relation to the individual patient's preoperative levels.

Of the patients undergoing estrogen therapy, most had a 500 mgm. stilbestrol pellet implanted for uniformity. Estrogen in the intact patient depressed steroid excretion further than castration alone, and in castrated patients, the estrogen therapy depressed the 17 ketosteroid excretion even further than for the intact estrogen treated patients.

The fluctuations of sedimentation rate and acid and alkaline phosphatases were also tabulated and when they were elevated at the onset, they showed considerable parallelism to the steroid excretion levels.

In the 4 cases presented, the clinical symptomatology was closely related to the steroid levels. When the steroid levels rose, the patients were sicker, had symptoms, and were obviously "escaping" therapy. A favorable therapeutic response was associated with a drop in the steroid level. The clinical state paralleled the chemical state. —*John R. Herman, M.D.*

Results of 123 Retropubic Prostatectomies. (Text in Greek). A. A. Deliveliotis. *Helliniki Iatriki*, 1957, 26B: 1005.

One hundred and twenty-three patients underwent retropubic prostatectomy by the author who prefers this approach for almost all cases of benign prostatic hypertrophy. The age of the patients varied from 54 years up to 91, 36 of them being between 54 and 65 years, 68 between 66 and 75 years, and 19 between 76 and 91 years. There were 15 patients with complete urinary retention, 13 with 500 to 800 c.c. of residual urine, 30 with 200 to 500 c.c., 53 with 100 to 200 c.c., and 12 with no residual urine. The weights of the resected specimens were 20 to 40 gm. in 13 cases, 40 to 120 in 82 cases, and 120 to 205 in 28 cases. Eighty-three patients (71.5 per cent) had a prominent median bar; 98 had satisfactory renal function preoperatively, and 25 had impaired renal function, high blood urea nitrogen, and low concentrating power. Six of the patients had associated nephrolithiasis, 12 had calculi in the urinary bladder, and 2 had calculi within the prostate gland. Associated diseases of the cardiovascular system were present in 68 patients, 12 of them with a history and electrocardiographic evidence of an old myocardial infarct, 3 with electrocardiographic evidence, but no history, of a previous myocardiac infarct, 5 with arteriosclerotic myocarditis, 21 with coronary insufficiency, and 27 with a varying degree of hypertension. As to the other systems there were 8 patients with chronic duodenal ulcer, 2 with Parkinson's disease, 3 with bronchial asthma, and 2 with chronic bronchitis. Finally, there were 22 diabetics all under control, with or without insulin.

The author followed the technique of Millin for all the prostatectomies and he cut the urethra with scissors rather than use traction in order to avoid injury to the external sphincter. The postoperative care was routine, with special attention to keep the indwelling catheter always open.

Criteria for the removal of the catheter consisted mainly of the rate at which the urine cleared. In 78 of the cases the catheter was removed on the fourth or fifth day, in 37 on the sixth or seventh day, and in 8 on the ninth day. One hundred and six patients had normal urination immediately after the removal of the catheter without any wetting of the suprapubic wound. In 17 patients the catheter was replaced because of urine leakage through the anterior wound. Three patients developed hematuria 11, 12, and 13 days, respectively, after surgery and a hemostatic balloon catheter had to be inserted for 48 hours. Incontinence was not a serious problem in the series. There were only 6 patients who presented temporary incontinence and 2 who showed a more or less persistent one, a condition which improved under treatment. Seven patients developed unilateral epididymitis despite the fact that the cords were ligated. There was not a single case of pubic osteitis, stricture of the urethra, neuralgia, or very marked incontinence. The average hospital stay was 2 weeks. As far as mortality is concerned, there was only one death from pulmonary embolism in the whole series (0.8 per cent).

The author considers that retropubic prostatectomy has given very satisfactory results in his hands. It is necessary to carry out a careful properative evaluation and physical examination and at operation a clean dissection with thorough enucleation of the gland and careful hemostasis.

—*Michael G. Seremetis, M.D.*

MISCELLANEOUS

A Comparison of Bacterial Counts of the Urine Obtained by Needle Aspiration of the Bladder, Catheterization, and Midstream-Voided Methods. Ofelia T. Monzon, Edwin M. Ory, Harold L. Dobson, Edward Carter, and Ellard M. Yow. *N. England J. M.*, 1958, 259: 764.

Pyelonephritis remains a diagnostic and therapeutic problem, the rational management of which depends upon appropriate studies of the urine. Several procedures which are being utilized at the present time are:

1. Gram stained smears of the uncentrifuged specimen, which when correlated with quantitative bacterial studies of the urine are approximately 80 per cent reliable.

2. "Glitter cells," obtained with a supravital stain to bring out special characteristics of leucocytes seen in the urinary sediment of persons with infected urine. Two types of granulocytes have been differentiated.

One of them is a pale staining cell, the nucleus of which is pale blue or colorless and the cytoplasm pale blue to colorless, with fine granules. These cells have been found in the urine of patients with clinical pyelonephritis and are thought to be vital granulocytes from the inflamed kidney.

3. Culture of the fresh urine with quantitative bacterial counts which are deemed significant when the count is above 100,000 per milliliter of urine or more.

4. Antimicrobial sensitivity tests. The disk method is usually adequate; however, tube-dilution methods yield quantitative information, indicating the concentration of the agent needed to exert a bacteriostatic or bactericidal effect.

5. Percutaneous renal biopsy. This procedure is accompanied by approximately a 10 per cent complication rate; however, none of the complications were fatal. Cultures and histologic studies of the tissues obtained give the most direct approach available for the diagnosis of pyelonephritis.

The present study was undertaken to determine the role of urethral contamination in low bacterial counts of the urine, inasmuch as it is known that the urethra harbors bacteria which may contaminate the specimens obtained either by catheterization or by voiding. Percutaneous needle aspiration of the urinary bladder was used to collect specimens and to compare the specimens thus collected with those obtained by mid-stream voiding and catheterization. The method used was to wait until the patient's bladder was full, and then the specimen was obtained by needle puncture of the anterior abdominal wall, under local anesthesia. Immediately afterwards, mid-stream voided and catheterized specimens were collected. All specimens thus obtained were cultured. Thirty-four patients were studied; of these, 7 patients had positive cultures from all specimens, 5 had more than 100,000 organisms per milliliter of urine. In those patients with positive cultures from the catheterized specimens and sterile aspirated specimens, the colony counts were much lower than 100,000 per milliliter of urine. It was apparent that a greater number of sterile specimens can be obtained by the suprapubic aspiration, and that there is good correlation between the colony counts of 100,000 organisms per milliliter of urine and the presence of pyelonephritis. There were no appreciable differences if the colony counts of specimens obtained by any of the procedures done, namely, aspiration, voiding, and catheterizing techniques, were above 100,000 bacteria per milliliter. It is suggested that the positive cultures from catheterized specimens having low colony counts are primarily the result of urethral contamination.

—*Robert O. Beadles, M.D.*

Uroepithelium Transplantation to Intestinal Segments. M. G. GILBERT, WILLIAM PACE III, and R. G. IZANT, JR. *J. Urol.*, Balt., 1958, 80: 237.

THE CONSTANT ABSORPTION of urinary products by bowel mucosa in certain urinary diversion operations is the main reason for chemical imbalance. Reservoir procedures that make use of bowel segments, which confine urine under increased pressure behind a sphincter, share this danger. It would be ideal if the reservoir pouch could be lined with a nonabsorptive surface. The authors present their experimental

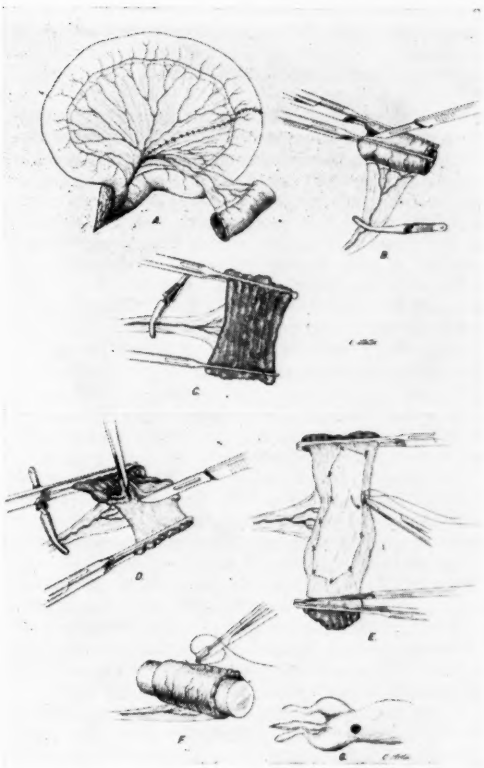


FIG. 1 (Gilbert *et al.*). Operative technique.

results, working on dogs, in the removal of bowel mucosa and the grafting of uroepithelium in its place.

A preliminary experiment was carried out on 7 mongrel dogs. After suitable preoperative preparation of the bowel, segments of ileum were isolated in 2 subjects and segments of the colon in 5. The segments were opened longitudinally on the antimesenteric side and the mucosa removed by blunt and sharp dissection. A biopsy was done to evaluate the effectiveness of mucosal excision. The dome of the bladder was then removed and the uroepithelium layer excised. This layer was tacked on with 00000 chromic sutures to the submucosa of the bowel segment with the mucosa facing the lumen. For stabilization of the graft, the bowel was closed longitudinally over a piece of large bore polyethylene tubing and returned to the peritoneal cavity.

The dogs were sacrificed at intervals of 12 to 60 days and multiple histologic sections made from the transverse axis of the grafted bowel segment. Infection was present in 5 of the 7 dogs, 4 with abscess formation. All biopsy specimens taken at the original grafting, except 1 in which submucosa as well as mucosa was removed, revealed incomplete removal of bowel mucosa. There was, therefore, massive glandular epithelial regeneration in 6 cases.

Preliminary studies then demonstrated that transplantation of uroepithelium to bowel mucosa might be feasible if (1) the incidence of infection could be decreased, and (2) the bowel mucosa could be prevented from regenerating.

In a series of definitive experiments techniques were devised to solve problems of infection and contracture of transplanted uroepithelium and to prevent regeneration of intestinal mucosa on bowel submucosa. In one experiment transplants were made to 6 ileal and 6 colonic segments. A serrefine clamp on the mesenteric pedicle was used to prevent blood loss and to allow for meticulous mucosal excision on a stretched out bowel segment with flattened rugae. It was found that scraping the mucosa in the transverse axis facilitated complete mucosal removal. The bladder dome uroepithelium was tacked on as previously to the submucosa with the mucosal surface facing the bowel lumen. The segment was closed over a piece of plastic tubing, which was passed through an opening in the abdominal wall and tacked to the skin to prevent retraction.

Autopsy was performed in 8 to 50 days. Only one dog had gross infection of an ileal loop and 2 dogs had microscopic evidence of infection. Multiple transverse sections showed more than 50 per cent take of the graft in 67 per cent (8 dogs), no take in 2, and about 10 to 15 per cent take in 2 others. In 3 of the 4 with poor results there was evidence of infection. In 8 of 12 segments no regeneration of bowel mucosa was present. In 3 of these, the submucosa had been removed in continuity with the mucosa and the uroepithelium graft took well on the muscularis.

In another experiment there was a transplant of uroepithelium to 7 rectal segments after the establishment of a permanent colostomy proximally. The distal rectosigmoid segment was inverted, pulled through the anus, and stretched over a soft plastic tubing to facilitate the removal of mucosa and the application of the uroepithelium. The tubing was then removed and the rectal segment was inverted back to its original position as a blind uroepithelium lined pouch with the proximal end closed. An air filled condom, serving as a splint for the uroepithelium, was maintained for 2 days in the rectum by purse string suture about the anus. In 5 of the 7 dogs there was complete take of the graft. In the others, one with less than 20 per cent take and one with no take, there was evidence of infection. There was no evidence of the regeneration of mucosa in any of the segments.

The unusual osteogenic properties of uroepithelium brought in contact with connective tissue have been demonstrated experimentally. Such bone formation, as shown by Marshall, does not occur when a cyst of transitional epithelium with the epithelium on the inside, not in contact with connective tissue, is transplanted into a dog's rectus sheath. Because of these findings, special care was taken in these experiments to transplant the uroepithelium with its mucosal layer toward the lumen of the bowel to prevent osteogenesis in the submucosa.

The authors state their work has shown that transplantation of autogenous bladder mucosal grafts to bowel segments for formation of an artificial bladder in the dog can be performed. The problem of infection was overcome by drainage of the bowel segment as an open enterostomy stoma. Contracture of the grafted segment was partially prevented by insertion of air filled splints and daily dilatations. This problem requires further study. Regeneration of intestinal mucosa on submucosa was partially eliminated by meticulous care in removal of the mucosa.

—*Allan K. Swersie, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES TENDONS, ETC.

A Follow-Up Study of the Initial Group of Cases of Skeletal Tuberculosis Treated with Streptomycin, 1946-1948. ABRAHAM FALK. *J. Bone Surg.*, 1958, 40-B: 1161.

THIS STUDY represents a follow-up to January 1, 1957 of 187 consecutive patients with skeletal tuberculosis, who were treated with short courses of streptomycin alone during the period 1946 to 1948. Seventy per cent of the 187 patients were between 21 and 40 years of age when treatment with streptomycin was started. In 151 patients the lesions were located in a weight-bearing portion of the skeleton; in fact, in 112 they were in the spinal column. In the remaining 39 of the 151 patients they were in the knees, hips, ankles, or feet. The most common location of the lesions which were in nonweight-bearing regions was in the wrist. Tuberculous lesions were present at the start of chemotherapy in 115 of the 187 patients, 81 of them having pulmonary lesions.

The antimicrobial therapy offered these patients consisted of streptomycin alone given in a dosage of either 1 or 2 gm. daily. Fifty patients were treated initially for 40 to 60 days, 32 for 61 to 90 days, 90 for 91 to 120 days, and only 15 for more than 120 days. Forty-one of the patients had subsequent treatment with streptomycin during the same period of hospitalization in which they had had the initial antimicrobial therapy.

Sixty per cent of the patients with spinal lesions had associated paravertebral abscesses, and half of the patients having abscesses were treated surgically. There were only 4 instances of recurrence of abscess associated with vertebral lesions and no recurrences among patients who had been treated surgically. Those who had not been treated surgically had a slightly higher death rate from tuberculosis and a higher rate of relapse and development of new lesions. The total rate of relapse, which was judged to be either a reactivation of an old lesion or the development of a new lesion, was 35 per cent in the entire group, and the majority of the relapses occurred within the first 5 years after the initial treatment with streptomycin. This rate indicates a high incidence of relapse during the first 5 years of observation, a fact which has been noted in other similar groups of cases. Thirty-three deaths occurred in this series, 18 of which were due to tuberculosis and 15 to nontuberculous lesions.

Given alone for more than 60 days, streptomycin seemed to have a significant effect in reducing the relapse rate of all tuberculous lesions. Sixty-four per cent of the entire group of patients who received streptomycin for 120 days or less had no subsequent relapse and did not die from tuberculosis. In short, the effect of the antimicrobial therapy used in this series of patients reflected itself in a lowered rate of tuberculous relapse, a lowered death rate, a greater chance for survival, and a high rate of functional recovery and return to activity. The author summarized his findings from this report by saying that longer courses of antimicrobial therapy and combinations of other agents should demonstrate further improvement in the relapse rate and mortality from tuberculosis, as well as in the clinical response and increased rate of return to productivity.

—*Einer W. Johnson, Jr., M.D.*

Giant Cell Tumor of Bone. BRADLEY L. COLEY, NORMAN L. HIGINBOTHAM, and TATSUMI KOGURE. *Am. J. Surg.*, 1958, 96: 479.

THE TERM "giant cell tumor" refers to a specific type of primary bone tumor whose features are characteristic enough to be accepted as a clinical entity. However, wide differences of opinion are still expressed by various authors as to the outcome of treatment and other problems having to do with this type of tumor, and many controversial features regarding the disease still exist. The series studied by the authors includes 108 cases; all tumors were verified microscopically as giant cell tumors. The previous literature is reviewed rather completely as are the work of Jaffe and his grading of giant cell tumors as a guide to the estimation of their eventual outcome. The authors, however, have disagreed with Jaffe's work and stated that it is not possible to predict the ultimate outcome of a case of giant cell tumor from the initial histology of the tumor and that Jaffe's grading of these tumors into three categories is not reliable.

Nearly 50 per cent of the patients were in the third and fourth decades of life; the youngest patient was 11 years of age and the oldest was 71. Giant cell tumor originates in the epiphysial region from which it may extend to the adjacent metaphysis and even to the diaphysis of the bone in question. Pain is the most prominent presenting complaint, and pathologic fracture was noted in 9 of the 108 cases. Objectively, swelling, tenderness, and limitation of motion in the adjacent joint are present at examination. Roentgenograms reveal characteristic circumscribed osteolytic regions in the epiphysial portion of the long bone which sometimes involve the adjacent metaphysial region. Trabeculations sometimes may be seen and give a compartmental or bubblelike appearance; occasionally erosion of the overlying cortex is evident. Open biopsy of such a tumor is necessary to establish the diagnosis. In 15 of the 108 cases the lesions were interpreted as being malignant giant cell tumors; 4 lesions were diagnosed as malignant from the outset, while 11 tumors changed from a benign to a malignant appearance during the course of treatment. Reports of 6 illustrative cases are included in the article, as well as a summary of the effects of treatment in the 108 cases.

From this study it may be concluded that this type of neoplasm is unpredictable and recurrence often follows both surgical and radiation therapy. The need for a uniformly successful method of treatment is emphasized and the authors have suggested resection

of the tumor-bearing portion of the bone, if possible; this procedure, in their opinion, offers an excellent prospect of cure. If resection is not possible, they suggest curettage, chemical cauterization, and implantation of bone chips into the cavity. If the primary site is surgically inaccessible, they suggest initial radiation therapy, which should seldom exceed 2,800 to 3.000 roentgens. Recurrence was not reported in any of the 108 cases in which adequate resection of the benign giant cell tumor was performed as a primary method of treatment. The authors favor a guarded prognosis.

—Einer W. Johnson, Jr., M.D.

Changes of the Basal Skull in Torticollis, with Analysis of the Etiology of Skull Asymmetry (Schaedelbasisveraenderungen beim musculaeren Schiefhals, ein Beitrag zur Entstehungstheorie der Schaedelasymmetrie). HEINZ PITZEN. *Zschr. Orthop. Grenzgeb.*, 1958, 90: 125.

FROM THIS VERY DETAILED ANALYSIS, mostly based on reports in the literature and 32 patients, the author tries to answer the following questions:

Is torticollis and the accompanying skull asymmetry the result of an ossification disturbance in the os tribasilare?

Is the skull asymmetry primary or secondary to the torticollis?

To what extent does the cervical scoliosis cause asymmetry of the skull?

Is the intrauterine pressure theory still valid for the explanation of torticollis and congenital scoliosis capitis?

The impression is gained that an asymmetric skull is a condition resulting from scoliosis of the cervical spine. The torsion of the skullbase is the result of a cervical scoliosis with torsion of the upper cervical vertebrae, which in turn is caused by a genetic connection between the base of the skull and the spine. The facial asymmetry is an indirect secondary condition caused by shortening of the sternocleidomastoid muscle. The scoliosis of the cervical spine as a primary or secondary deformity during growth causes the skull asymmetry. The scoliosis in a newborn is due to a long-standing fixation of the spine during prenatal growth. In conclusion, it is stated that the intrauterine pressure theory has no validity.

—E. H. Bettmann, M.D.

The Pathologic and Anatomic Causes of Localized Spine and Shoulder Pain (Pathologisch-anatomischer Beitrag zu den Ursachen der lokalisierten Wirbelsaeulen und Schulterschmerzen). J. THURNER and B. GIORGI. *Zschr. Orthop.*, 1958, 90: 151.

DUPLAY, in 1872, first described the "painful shoulder stiffness" or periarthritis humeroscapularis. Baer, in 1936, could furnish proof of the etiology based on damage of degenerative nature in the tendinous insertions. The tendons of the spinal and dorsal shoulder blade muscles are inserted directly into the bone without any periosteal anchorage. Geschickter and Copeland are reported to have found precartilaginous strands aiding in the formation of normal bony protuberances.

The author studied the degenerative changes of the hyaline cartilaginous layers of the seventh cervical spinous process and the medial scapular margins showing histological gaps and chondroclastic changes (bradytrophic tissue); the degenerative process stimulates chondroclastic and osteoclastic changes with the formation of occasional spurs. Parallel to this, tendinous changes occur. Excessive pressure or stress on the hyaline cartilage forms the basis of all arthropathic and tendopathic changes, changing a functional stimulus into a pathological one. The snapping or crepitating scapula is evidently caused by degenerative cartilaginous changes at the tuberculum Luschka, located at the superior scapular margin. The author found also a bursa in the same location, calling it a tuberculum hemiarticulation. The so-called "insertion endopathies" may be compensable on an occupational basis. The cartilaginous zones of 25 anatomical specimens of the seventh cervical vertebra and the same number of scapulas show degenerative changes in later years, which are analogous to the arthropathic and spondylopathic damage, often the source of poorly localized back or shoulder pain.

—E. H. Bettmann, M.D.

Pronator Syndrome: A Confirmed Case and Its Diagnosis. HARVEY P. KOPELL and WALTER A. L. THOMPSON. *N. England J. M.*, 1958, 259: 713.

SENSORY OR motor components may be involved in the pronator syndrome which is considered to be a compression neuropathy of the median nerve as it passes through the muscles of the proximal forearm. The point of pressure is considered to be the pronator teres muscle. Occasionally, fibrous bands have been noted in the muscle in these cases.

The course of the median nerve relative to the pronator teres muscle is subject to some variation. Most frequently it passes between the two heads of the pronator teres muscle and then under the flexor sublimis muscle. The proximal end of the sublimis has been called the sublimis bridge. As the nerve continues down the forearm, it is loosely held to the underside of the sublimis. The anterior interosseous nerve is usually given off at the level of the pronator teres muscle. The major innervation of the median nerve is effected distal to the pronator area. This supply is as follows:

Motor: opposition and abduction of the thumb; flexion of the first and second metacarpophalangeal joints; pronation and assistance in wrist flexion; flexion of the proximal intercarpal joints; and flexion of the distal intercarpal joints of the first, second, and third digits.

Sensory: palmar surface of the first, second, and third digits extending proximally to the wrist crease and distally over the fingertips to a variable distance up the dorsum.

A diagnostic aid used has been the injection of hydrocortisone into the pronator region. The injection has been followed by temporary relief of symptoms in the hand. Symptoms sometimes include incoordination of the thumb and fingers, but a tender spot in the thenar eminence has also been found in many cases. At operation, anomalous bands at the ulnar head of the pronator and the sublimis bridge have been divided with considerable success.

—J. Robert Close, M.D.

De Quervain's Disease; A Clinical and Anatomical Study. LUIZ LEÃO. *J. Bone Surg.*, 1958, 40-A: 1063.

SINCE De Quervain's disease is more common among persons who perform manual work, household servants, weavers, typists, or nurses, it forms a medico-social problem that has a tendency to worsen because of the requirements of modern industrialization.

The author conducted a dissection of 50 wrists of 27 fresh cadavers. Twenty were male, and 7 were female. There were 8 fetal wrists and 42 adult wrists. A longitudinal incision was made along the lower third of the forearm. the radial region of the wrist, and the radial border of the hand and thumb. Photographs were made of all the dissections, and no artifice was used to enrich the details of the anatomical structures.

The extensor pollicis brevis was inserted in 38 specimens into the distal portion of the proximal phalanx of the thumb and in 9 specimens into the distal phalanx. There were 64 tendinous variations of the abductor pollicis longus in the 50 wrists studied. The anatomical findings suggest that the existence of more than two tendons in the radial osteofibrous groove should not be considered abnormal. The fasciculation observed is the result of the specialized function of the thumb. Trauma cannot be considered the sole cause of tenosynovitis stenosans. The author suggested that predisposing factors, such as the subsequent development of rheumatoid arthritis, play a very important role.

In the study of 32 wrists in 29 patients, 27 (84 per cent) of the patients were female, and 5 (16 per cent) were male. Twenty-six (81 per cent) were white, 6 (19 per cent) were colored.

The symptoms appeared suddenly in 8 wrists, and gradually in 24 wrists. Pain was the predominant symptom, and was noted in every patient. Localized pain on the radial border of the wrist was noticed in 31 wrists; referred pain in 9 wrists; pain radiating to the thumb in 12; pain radiating to the forearm in 10; and to the forearm and arm in 2. A visible or palpable tumor on the radial surface of the wrist was found in 26. In 23 wrists, Finkelstein's sign was strongly positive and in 9, it was positive.

Nine wrists were operated on, and 21 were treated conservatively. Histologic sections were obtained from 8 wrists. Surgical treatment consisted in removing the fibrous covering of the osteofibrous groove. In one wrist four tendons were found. In 5 wrists there were only two tendons—one for the abductor pollicis longus and the other for the extensor pollicis brevis.

Twenty-five patients (78 per cent), all of whom were treated more than 2 years previously, were re-examined. A complete cure was observed in all of these patients. It is interesting to note that even the 2 patients who refused treatment were also free from symptoms. It is evident that surgical treatment offers quicker and more definite cures than conservative treatment. Patients with a strongly positive Finkelstein's sign were all asymptomatic on re-examination.

De Quervain's syndrome runs an apparently cyclic course and tends to be cured completely within a variable length of time, depending upon the general condition of the patient. In recently treated patients, local injections of hydrocortisone, analgesic drugs, and plaster immobilization of the wrist and thumb afforded results leading to complete relief in an average period of 3 weeks.

A tabulation of the data on the 29 patients with de Quervain's disease is given and photographs of the wrist dissection on cadavers are included.

—C. Fred Goeringer, M.D.

Ainhum (Dactylolysis Spontanea). V. S. CHINCHOLKAR. *Ind. J. Surg.*, 1958, 10: 264.

AINHUM is a slowly progressive tropical or semi-tropical disease affecting the toes, particularly the fifth toes and more rarely the fourth and other toes of dark-skinned races. It is characterized by the formation of a furrow at the digitoplantar fold which deepens and extends until it finally encircles the toe. It may eventually result in spontaneous amputation.

The condition is found most frequently in South America, especially in Brazil and Argentina, and in North America in the southern states. It has also been rarely seen in the northern states and Canada. In Africa it is well known on the west coast and particularly on the Gold Coast. It has been seen in India, China, and Ceylon. Occasionally, it has been reported in southern Europe, particularly in Italy.

The cause of the condition is not known. Hereditary factors and scleroderma have been considered in the etiology.

The first sign of the disease is a narrow groove in the skin, almost invariably on the inner and plantar side of the base of the little toe. It may occur in one or both feet. This groove gradually deepens and extends around the entire circumference of the digit. As the contractile band progresses, swelling of the distal portion of the digit occurs. There is little or no pain. Finally, the digit may drop off.

Histologic examination of the contractile band reveals proliferation of the epidermis projecting downward into the cutis where the connective tissue is also increased in quantity. Endarteritis and periarteritis may be found in the vessels. Examination of the sweat glands reveals proliferation and fatty degeneration of cells and of the bone, rarefying osteitis. No pathologic organisms have been observed.

—J. Robert Close, M.D.

Histological Changes in the Joint Capsule in Congenital Traumatic and Paralytic Dislocation of the Hip Joint (Histologische Veraenderungen in der Gelenkkapsel bei angeborener, traumatischer und paralytischer Hueftgelenksluxation). MARGRET LANGE. *Zschr. Orthop.*, 1958, 90: 270.

THE AUTHOR examined 1,185 sections of joint capsules in cases of congenital and traumatic dislocation of the hip.

There was no evidence of thickening of the joint capsule in cases of congenital dislocation whether they received prior treatment or not.

In cases of congenital dislocation in older children without prior treatment, the author observed thickening of the capsule overlying the proximal portion of the dislocated head resulting from an apparent attempt to hold the head in its position and to prevent further upward sliding of the femoral head. The synovial portion of the joint capsule was thickened and comprised about two-thirds of the entire thickness

of the capsule. In children who received manipulative treatment prior to this examination, some thickening of the lateral portions of the joint capsule was also observed. There were localized lymphatic infiltration and perivascular leucocytic infiltrations. No degeneration was found.

In congenital cases of hip dislocation in adults without previous treatment, thickening of the capsule, particularly in the lateral portions, was observed. The synovial portion of the joint capsule was enlarged, comprising about three-fourths of the entire thickness. Many perivascular and localized, as well as diffuse, leucocytic infiltrations were observed in all layers of the joint capsule. The cartilaginous fibers of the capsule were found loosely arranged, and fatty degeneration was observed in both the synovial membrane as well as in the fibrous portion of the capsule. In cases in which the dislocation of the hip in adults had had prior treatment, the outstanding feature was the considerable amount of fatty degeneration found in both the synovial and fibrous portion of the joint capsule. There were areas of edema and degeneration of the blood vessel walls.

In cases of traumatic dislocation of the hip, most of the changes were observed in posterior or anterior dislocations. In cases of central dislocation, very few changes in the synovial capsule were observed. In the course of the dislocation of the femoral head the capsule was torn in many instances, which later gave rise to degenerative changes in that area. In cases in which the dislocation was reduced immediately, the damage to the joint capsule was quickly repaired and no damage to the femoral head occurred. In cases in which avascular necrosis of the femoral head was a complicating factor, many degenerative changes were observed in the joint capsule. There was thickening of the joint capsule to about three times its average width. Areas of inflammatory reaction were observed in all layers of the joint capsule. The position of cartilage and, occasionally, of bone within the cartilage was observed. The bony trabeculae were usually found in close proximity to the cartilage. It is well known that cartilage does not require vascularity for its survival. It is therefore found in areas of poor vascularization and necrosis.

In cases of paralytic dislocation, the joint capsule showed the following changes:

In none of the cases was there degeneration or vascular infiltration. There was a considerable amount of fatty infiltration of the connective tissue making up the joint capsule. In some instances the capsule appeared to be thinner, and an absence of cartilaginous and vascular fibers was also noteworthy.

—*George I. Reiss, M.D.*

Slipping of the Upper Femoral Epiphysis. P. H. Newman. *Lancet*, Lond., 1958, 2: 499.

The standard treatment of slipping of the upper femoral epiphysis is insertion of a Smith-Petersen pin (or similar device) across the epiphysial line. It immediately stabilizes the epiphysis; it prevents further slipping; and it accelerates fusion at a favorable age and at a level where interference with the length of the limb is not serious. A child can usually return to school after 3 weeks. The limitation of the method is that it cannot be used when the displacement exceeds one-third of the maximum.

The author recommends that these patients be treated as surgical emergencies and that admission to the hospital be immediate. Untreated, the epiphysis is apt to go on slipping with a resultant worsening of the prognosis. The cases of 45 patients treated by the author over the past 10 years have been analyzed for causes of delay in definitive treatment. The average time between the onset of symptoms and the diagnosis was 26 weeks. The average time between diagnosis and admission for definitive treatment was nearly 4 weeks. The causes of the delay were as follows:

1. Failure of the patient to recognize and report symptoms.
2. Failure of parents, schoolteachers, or games' staff to recognize and report symptoms.
3. Delay in clinical diagnosis.
4. False radiologic reassurance.
5. Lack of realization of the urgency of treatment by the referring doctor, or by the hospital clerical or surgical staff.

The diagnosis of slipping of the epiphysis may be difficult. The symptoms are invariably pain, a limp, or both. The pain sometimes is localized to the hip, but more often it is referred to the lower anterior part of the thigh or to the knee. There is generally no other complaint. Examination of the hip will show limitation of abduction, of flexion, and of internal rotation, depending on the degree and the direction of the slip. It is rational to submit any child or adolescent who complains of pain in the hip or knee to roentgenographic examination of the hip joints. False radiologic reassurance was the cause of delay in 7 cases. The omission of a lateral roentgenogram was the reason for the mistake.

Delay in definitive treatment of slipping of the upper femoral epiphysis makes the prognosis much worse.

—*Bernard C. Gerber, M.D.*

Unexplained Destruction of the Shaft of the Femur in a Child. R. W. Butler and R. A. McCance. *J. Bone Surg.*, 1958, 40-B: 487.

The patient was a 5 year old boy who was admitted with a slight limp and weakness of the right thigh muscles. Four months previous to this attack he had had his tonsils removed and had a mild attack of measles.

Examination revealed a slight weakness of the quadriceps femoris and the hip flexor muscles of the right side, which was thought to be due to a mild attack of poliomyelitis. A month later he broke the shaft of the right femur. A small amount of callus formed but this callus reabsorbed and in the course of the next 5 months the greater part of the uppermost and middle thirds of the shaft of the right femur was absorbed. There was undoubtedly some type of a destructive process at work. There was some pain at the time of fracture. Outside of this, there were no symptoms, no elevation of temperature, and no evidence of a general or local infection. The results of all of the laboratory tests were within normal limits. This destructive process of the femur continued for 8 months after the original onset of the symptoms. Roentgenograms taken at frequent intervals revealed

a continuing progressive absorption of the femur. Cortical bone and six inches each of the fifth, seventh, and ninth ribs on the right side were used around the defect, and the limb was immobilized in a plaster spica.

There was some extra shortening during the next 6 months. Ten months after the operation a rigid tibial graft had to be removed. The epiphyses of the lower end of the femur and the upper end of the tibia began to fuse prematurely. This fusion produced progressive comparative shortening of the leg and marked genu valgum, which was later corrected. At the age of 11 epiphysiodesis of the left lower femoral and upper tibia was carried out. At age 16 the leg was 7 inches short.

The histology of the sections taken from the original site and from the tibial transplant revealed nothing specifically diagnostic. An eosinophilic granuloma must be considered to be theoretically possible in this case. An isolated white cell count revealed 12 per cent of eosinophils.

—*Richard J. Bennett, Jr., M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Repair of Tendon Injuries in the Hand. MICHAEL L. MASON. *Northwest M.*, 1958, 57: 1287.

TENDON IS A highly specialized tissue made up of long collagen fibers held together rather loosely and supplied with few nuclei. Surrounding the tendon is a thin peritendinous tissue. When subjected to longitudinal pull, the tendon has tremendous strength, but pull in a lateral direction results in fraying of the fibers. Tendon circulation is not abundant; however, it receives blood from three sources: from the point of insertion in the bone, from the origin of tendon from muscle, and from surrounding tissues. In the tendon which is surrounded by a tendon sheath, the vessels come in through a mesentery-like structure known as the mesotendon. Tendons not covered by sheaths lie within areolar tissue known as paratenon and receive blood vessels from the paratenon on all sides. Where a tendon must subtend the arc of motion of the joint, it is held against the bone by ligamentous structures or tunnels, and if these tunnels are disrupted or are not repaired after injury, bow-stringing of the tendon results.

Tendon heals in three phases: the first week of healing is largely exudative in nature, and the ends are held together with little tensile strength. During the second week this exudate becomes organized into fibrous tissue which holds the ends together more securely, although they can still be pulled apart. After the third week the strength of union of the tendon ends becomes increasingly greater until at the time of maturation at several months, it is as strong or stronger than the original tendon. If the healing tendon is subjected to motion or too great stress, during the period of healing, it either separates completely or partially, and the site of union which is surrounded by a callus becomes thick and heavy and this callus becomes densely adherent to surrounding tissues. Therefore, healing tendons should be kept at rest for a period of three weeks and function should be started after this period on a restricted basis to prevent too great proliferation of callus.

Suturing of tendons should be carried out with very fine, thin suture material (silk, cotton, or steel) and the sutures should be so introduced that they pull transversely to the line of the tendon fibers rather than parallel to this line since they will pull out very easily. Actually, the most important factor in favoring healing of tendons is relaxation by splinting. Splinting should be carried out for a minimum period of 3 weeks for flexors, and 4 weeks for the extensors.

Repair of tendons of the hand may be carried out either as a primary, or secondary procedure. As a primary procedure there are some very strict indications since tendon is exceedingly sensitive to trauma and to infection. The upward time limits of 6 to 8 hours should be strictly followed; for repair of flexor tendons within the digits probably not more than 2 hours should elapse between injury and repair.

The nature of the injury is likewise important; in clean lacerations or incised wounds, primary repair may frequently be undertaken. In crushing injuries and injuries with open fractures, primary repair is seldom if ever permissible. When there has been loss of covering tissue primary repair cannot be carried out, since the healing tendons must be covered with an adequate flap of skin and subcutaneous fat.

The most frequent site about which there is discussion concerning primary repair is that within the flexor digital tunnel from the middle of the middle phalanx upward to the end of the tunnel at the metacarpophalangeal joint. In this area three tendons are present, the two sublimis slips and the single slip of the profundus. When all of these tendons have been divided, primary repair may be accomplished if all conditions are absolutely satisfactory. The profundus only should be sutured, the sublimis removed, and a window removed from the fibrous sheath over the area of suture.

Division of the profundus tendon distal to the insertion of the sublimis is amenable to primary suture. Injuries of tendons in the palm, and lower forearm may be repaired primarily, other conditions being favorable. Both the profundus and sublimis can frequently be repaired; however, the sutured profundus alone will yield a satisfactory functional result.

In those cases of tendon division in which primary repair does not seem to be indicated the wound is simply cleansed, damaged tissue is excised, and the wound is closed. After satisfactory healing has occurred the wound is reopened and repair is carried out, usually by means of a tendon graft, although occasionally secondary suture is feasible.

Tendon grafting is particularly necessary in the case of tendons divided within the digital canal. The source of the graft is either the palmaris longus tendon or one of the common extensors of the toes. The remnants of the divided tendons are removed from the digit with great pains to preserve small but adequate pulleys over the middle and proximal phalanges. The graft is attached distally by snubbing it beneath the short remnant of the profundus. It is attached proximally well up in the palm to the proximal profundus stump; the lumbrical muscle is tacked around the area of suture. The tension at which it is placed

should be such that when the wrist is allowed to fall back into dorsiflexion the repaired finger is flexed to a slightly greater degree than the neighboring normal digits.

Tendon Transfers to Restore Function of Hands in Tetraplegia, Especially After Fracture-Dislocation of the Sixth Cervical Vertebra on the Seventh. PAUL R. LIPSCOMB, EARL C. ELKINS, and EDWARD D. HENDERSON. *J. Bone Surg.*, 1958, 40-A: 1071.

THE NUMBER of surviving patients with tetraplegia following trauma is increasing. Many of these patients sustain injuries between the sixth and the seventh cervical vertebra. These patients have on one side, and often on both, the following muscles functioning below the level of the elbow: the extensor carpi radialis longus, the extensor carpi radialis brevis, the brachioradialis, the flexor carpi radialis, and the pronator teres.

When the injury is at the level between the seventh cervical and the first thoracic vertebra, an appreciable number of functioning muscles is available for transfer of tendons to ameliorate the difficulty. Transfer of the flexor carpi radialis to the flexor digitorum profundus, the brachioradialis to the flexor of the thumb, and the flexor carpi ulnaris to oppose the flexor of the thumb, as advocated by Bunnell, is usually the procedure of choice in lesions at this level of the spinal cord. If it is evident that clawing will be a problem, this surgical procedure should be preceded as a separate operation by a Fowler transfer whereby the tendons of the extensor indicis proprius and the extensor digiti quinti proprius are divided longitudinally, are passed through the spaces of the interosseous muscles and through the canals of the lumbrical muscles to the transverse metacarpal ligament, and then are inserted into the combined intrinsic extensor aponeurosis of each finger. If clawing is not a problem, the extensor indiois proprius should be transferred at the time of the flexor and opponens transfers, as advocated by Bunnell, to abduct the index finger.

When the injury is higher than the sixth cervical vertebra and is accompanied by severe trauma to the spinal cord, the patient often does not survive for long. If he does survive, tenodesis is all that usually can be offered. When the injury is at the level between the sixth and the seventh cervical vertebra, all motor muscles of the fingers, including the intrinsic muscles, are paralyzed. Most of the patients so affected have only the following muscles functioning below the level of the elbow: the extensor carpi radialis longus, the extensor carpi radialis brevis, the brachioradialis, the flexor carpi radialis, and the pronator teres.

At times, because of the nature of the injury, the power of the flexor carpi radialis and pronator teres is greater on one side than on the other. If both these muscles are too weak for transfer, tenodesis to furnish flexion of the fingers and opposition of the thumb can be utilized.

During the past 3 years, tendons were transferred in 7 tetraplegic patients who had lesions of the cervical portion of the spinal cord between the sixth and the seventh cervical vertebra, 2 patients in whom the injury was one segment higher, one patient in whom the injury was one segment lower, and one patient who had spastic hemiplegia associated with compression fracture of the fifth cervical vertebra. The 7 patients in the first category were unable to move the fingers actively to the slightest degree; however, they had sufficient strength in the extensor carpi radialis longus, the extensor carpi radialis brevis, the brachioradialis, the flexor carpi radialis, and the pronator teres of at least one upper extremity to warrant the tendon transfers described. In 4 of these patients, the strength was such that bilateral transfers could be performed. Arthrodesis of the left wrist was performed in one instance in an attempt to gain stability and strength.

The author discusses the various surgical techniques, the types of splinting, and muscle re-education with accompanying illustrations and concludes that patients in whom such tendon transfers are done regain the function of hooking, light pinching, and grasping. These patients are able to discard special hand appliances and become more independent.

In the discussion of the paper, mention is made that when both radial wrist extensors are strong it is safe to use the extensor carpi radialis longus to provide another function. This muscle is suitably used to provide flexion of the fingers because of the synergistic action between the long digital flexors and the wrist extensors, and its greater power and amplitude. Extension of the fingers and thumb is a relatively unimportant function and can be achieved in the mobile wrist by tenodesis of the long extensors and Riordan's tenodesis of the intrinsic muscles to prevent clawing. When the basic functions of grasp and release have been achieved, then it is advisable to utilize the active muscles for supplementary functions, such as opposition and flexion of the thumb, individualized voluntary flexion of the index and long fingers, and abduction of the index finger.

—C. Fred Goeringer, M.D.

Use of Cutis as an Interposing Membrane in Arthroplasty of the Knee. JOSEPH E. BROWN, W. H. MCGAW, and DARRELL T. SHOW. *J. Bone Surg.*, 1958, 40-A: 1033.

ARTHROPLASTY of the knee joint was performed upon 4 patients with the use of autogenous cutis graft as interposing membrane. Preoperatively two of the knees were affected by bony ankylosis, and two with fibrous ankylosis. Two of the 4 patients had other major disability involving the joints of the lower extremities.

The end results of all 4 arthroplasties were rated as successful considering the condition of these knees prior to surgery. There was no instance of recurrent ankylosis, epidermoid cyst formation, or wound infection. The range of active motion that was restored postoperatively varied from 60 degrees to 80 degrees of flexion; extension of 180 degrees was achieved in all cases.

Instability or hypermobility, especially laterally, was observed in one knee. This condition required revision which restored stability without decreasing the range of motion in flexion and extension.

The range of motion restored after cutis arthroplasty appears to be governed by the underlying pathologic

condition, the integrity of the muscles controlling the knee joint, and, of course, the technique of arthroplasty. Preservation of both the medial and lateral collateral ligaments, when present, is imperative in any arthroplasty of the knee.

The authors believe that the cutis graft remains rubbery and elastic. The cutis graft is composed of the derma or true skin with the surface epithelium removed. The simplest and most satisfactory method of removing the epithelial layer is by splitting the skin or removing a thin split-thickness skin graft, which always includes a superficial layer of the dermis. For arthroplasty the material desired is the deeper layer of the derma with a minimum amount of fat but with the deeper, loosely arranged, and more elastic layer. This layer is composed of collagenous and elastic tissue, blood vessels and epithelial elements, the deeper portion of the hair follicles, sweat glands, and also oil glands.

A characteristic of the cutis which makes it usable for arthroplasty is the elasticity resulting from the anatomical arrangement of the fibers in the skin. Unlike fascia lata the skin will stretch in all directions and will conform to an irregular contour because of this arrangement of the fibers. Its elasticity, however, is greater in one direction than in another, again because of the fibrous tissue pattern.

The most satisfactory donor areas for obtaining the cutis graft are in locations where the skin is moderately thick and where there is least hair. Areas from which large sheets of graft may be best obtained are the lateral portion of the thorax, the lateral portion of the abdomen, and the upper lateral portion of the thigh or buttock, the latter especially in women for cosmetic reasons.

Collateral ligaments, when present and identifiable, were preserved and reattached to bone in the epicondylar region of the femur. In all cases, the cutis graft extended far enough proximally to restore a gliding surface for the quadriceps mechanism. The graft should be sutured with such tension as to approximate its original size; it should be applied drum-tight. The pull-out wire technique is recommended to maintain the graft in position until it has taken. The wires do not traverse bone and are removed 3 weeks postoperatively.

Immobilization of the reconstructed joint is desirable for a minimum period of 3 weeks to allow the cutis graft to take.

A complete description of the technique of cutis arthroplasty is given and illustrations in the article as well as the roentgenographic and histologic pictures are well depicted. —*C. Fred Goeringer, M.D.*

The Valgus Operation According to Gocht (Halluxvalgus-operation nach Gocht). F. KRANEPUHL. *Zbl. Chir.*, 1958, 83: 1505.

THE AUTHOR, who believes that the loss of the first metatarsal head does not impair the stability of the foot, uses the half metatarsal head resection followed by corrective extension (Figs. 1 and 2).

In order to avoid contact between the basal phalanx and the raw bone surface, a Kirschner wire is led through the big toe and kept against a soleboard in extension for 10 days. From 4 to 6 weeks are required for full ambulation. Nine and two-tenths per cent of all the patients showed unsatisfactory results. —*E. H. Bettmann, M.D.*

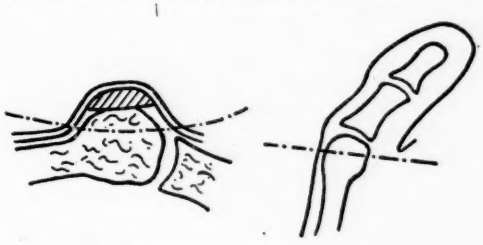


FIG. 1. FIG. 2.

FIG. 1. (Kranepuhl) Chiselling off of the exostosis and removal of the bursa in bloc.
FIG. 2. Resection of half the metatarsal head.

FRACTURES AND DISLOCATIONS

Treatment of Avulsion and Disinsertion of the Flexor Profundus Digitorum Tendon (Zur Behandlung des gedeckten Beugesehnenausrisses am Fingerendglied). H. SPÄNGLER. *Klin. Med.*, Wien, 1958, 13: 273.

THE AVULSION of the flexor profundus tendon is a much more uncommon injury than the avulsion of the extensor tendons, possibly because of its direct insertion into the base of the end phalanx. In contrast, the extensor tendons insert into the joint capsule. The usual mechanism of the avulsion is a sudden hyperextension force or unexpected resistance to a grasping action.

The author reports the case of a patient who acquired this injury while playing the popular game of "finger-pulling." The area of injury was explored through a Mason's bayonette type of incision and the avulsed bone fragment with the attached tendon was replaced in the anatomically correct position. For fixation a pull-out wire was inserted through the sizeable avulsed bone fragment and through the distal phalanx. The wire was led out to the dorsal surface and tied over a piece of gauze and threaded through a button. The finger was immobilized in flexed position for 4 weeks. After 4 weeks, active treatment was instituted and within the next month complete functional restitution was achieved; 2 years after surgery an excellent functional result was being maintained.

The treatment for disinsertion is the same, utilizing pull-out wire. A serious pitfall might be the unrecognized simultaneous tear of the flexor tendon with avulsion of the bone fragment. Both injuries should be repaired in similar fashion. —*Gunars Medins, M.D.*

Therapeutic Results in Patellar Fractures with Attention to Secondary Arthritic Changes (Ueber Patellarfrakturen und ihre Behandlungsergebnisse unter besonderer Berucksichtigung der Arthrosis deformans). K. PASCHOLD. *Zbl. Chir.*, 1958, 83: 1532.

PAYR FIRST EMPHASIZED the importance of the knee cap for the extensor mechanism of the knee, considering it as part of the joint unit and an influence on its

proper function. Early aspiration of a hematoma is necessary. Suture of the patellar fracture, done either as cerclage (Berger, Kocher) or with longitudinal sutures (Payr), must be combined with resuture of the parapatellar fascial and ligamentous structures.

Indications for nonconservative treatment are diastasis, extensor defect, and damage to the parapatellar structures. The author does not advocate the removal of the whole patella, which represents a necessary fulcrum, but recommends the partial extirpation of the smaller fragment and resuture with V 2 A wire.

Of 117 patients, 78 had transverse fractures and 33 had fractures of the stellate type, 41 of which were treated conservatively after aspiration of the hemarthrosis. The best time for operation is usually after one week has elapsed. An incision with a proximal convex base is chosen, with exposure of the paravertebral structures, and primary wire suture is followed by suture of the damaged lateral and medial compartments. The average time of hospitalization is 50 days. After 20 days, massage and exercises are started. In 10 cases the wire had to be removed. The secondary arthritic changes seem to be precipitated by the primary hematoma, together with the static changes and aseptic chondral or subchondral inflammation, and occur in from 30 to 55 per cent of the cases. —*E. H. Bettmann, M.D.*

ORTHOPEDICS IN GENERAL

The Different Histological Evolution Between the Newly Formed Bone from Homogenous and Autogenous Periosteal Grafts (L'os néoformé dans une greffe de périoste homologue présente une évolution histologiquement différente de celle d'une greffe autologue). A. Danis. *Acta orthop. belg.*, 1958, 24: 114.

The author reports his experiences with autogenous and homogenous periosteal grafts from the femur of adult rats implanted into the anterior chamber of the eye. The periosteal grafts were taken 5 to 9 days after the femoral medullary canal was reamed by the technique of Ollier.

When autogenous periosteum is used, ossification occurs constantly after 4 to 6 days, and is followed by the formation of a true ossicle. Even after 3 months there is no absorption of the newly formed bone. With homogenous periosteum, however, ossification is not a constant phenomenon and absorption takes place in every case within a 3-month period.

The author concludes that his experiments are a proof that periosteal tissue is capable of producing an ossicle with articular and epiphysial cartilage (organogenetic power) and that a fundamental difference exists between the evolution of autogenous and homogenous grafts. —*J. C. Mulier, M.D.*

The Result of Treatment of 1,000 Arthroses of the Knee Joint (Behandlungsergebnisse bei 1,000 Kniearthrosen). H. Groh. *Zschr. Orthop.*, 1958, 90: 324.

The author states that 22 per cent of all patients with arthrosis of the knee who were treated at his clinic between the years 1952 and 1956 were seen because of pain in the knee joint.

Osgood-Schlatter's disease comprised about one-third of the knee conditions treated in children between the ages of 10 and 15 years. A cylindrical cast was used in most instances. Painful thickening of the synovial membrane as well as hemarthrosis were also successfully treated with cast immobilization. Aspiration of the knee joint was done in cases of recurrent hydrarthroses. After aspiration, hydrocortone was injected into the knee joint.

Two-thirds of all the adult patients were females, complaining of pain and swelling in the knee joint, and in 20 to 25 per cent both knees were affected. Arthrosis of the knee joint was found to be 4 times more frequent after the age of 40 years. In 30 per cent of the cases, a traumatic cause was found. In many cases, focal infection was blamed for the changes in the knee joint. Genu valgum and varum was also found to be responsible for changes in the knee joint in 3 per cent of the cases. Obesity was found to be responsible in 12 per cent of the cases. Varicosities were found in 9 per cent of the cases.

Physical therapy, but particularly active muscle exercises requiring the use of the surrounding muscles, was found to be quite effective in the treatment of arthrosis of the knee joint. Elimination of foci and infection, x-ray therapy, intra-articular injection of amenophenosone, and the injection of plenosol in gradually increasing dosage were also successful. Occasionally the author used novalac (Vaugh's lactic acid mixture) with satisfactory results. Hydrocortisone was also used with satisfactory results.

—*George I. Reiss, M.D.*

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Wounds of the Primary and Internal Carotid Arteries. Present Therapeutic Perspectives Based on 20 Personal Cases (Les plaies des artères carotides primitive et interne. Perspectives actuelles de traitement à propos de 20 observations personnelles). ANDRÉ CARAYON, LUCIEN CORNET, and L. PARODI. *J. Chir.*, Par., 1958, 76: 241.

THE 20 CASES of carotid injury here reported include 5 without opening of the lumen, 11 with opening of the lumen, and 4 cases with arteriovenous fistulas. The lateral wounds and transfixions were usually treated by suppression of the blood stream at the level of the primary carotid artery (8 times). Conservative treatment was, however, indicated in some instances, and may be easy as in the 3 cases here described, but more frequently long operations may be necessary.

The chief danger is then cerebral ischemia. The cases are described in detail, including a schematic presentation of the types of lesion, the cerebral deficit, carotid intervention, and results. There were 3 deaths, one due to embolism, one to rupture of the scar with fatal secondary hemorrhage from a neglected wound in the cervical region, and one to hemorrhage during operation and paraplegia due to an unnoticed medullary lesion. The cerebral accidents included 4 hemiplegias and 1 hemiparesis.

It appears, therefore, that closed parietal wounds (contusions) are far from benign, since in 5 such cases there occurred 2 hemiplegias, one partial and one fatal. Closed wounds should receive most careful attention, since many cases require operation. Lateral wounds and transfixions are encountered chiefly in the primary carotid artery. In 15 such cases the circulation was interrupted by ligation, arteriectomy, or dissection of the aneurysm at the level of the primary carotid. No cerebral complications developed. Only one patient died because of an associated lesion. In 4 cases the blood stream was not interrupted and recovery was complete. In one case the counter current was reestablished by subbulbar suture, also with good results. One patient died during operation. In 2 instances operation was not performed, in one case because of secondary hemorrhage and in the other because of persistence of pre-existing hemiplegia.

It is stressed that much thought and reading are needed for the proper direction of treatment in these cases, and special attention is directed to the recent book on this subject by Arnulf.

Following a review of the physiopathology of cerebral vascularization, including cerebral collaterality, it is emphasized that the Matas test is the best clinical test for demonstrating hypovascularization of the corresponding hemisphere and for determining the need for conservation of arterial continuity.

The various operative techniques are reviewed, including nonconservative methods such as ligation, arteriectomy, and extirpation of aneurysms; conservative methods including subbulbar suture, circular suture following cuneiform resection of the bulb, and the operation of Petit-Dutaillis; and various other conservative or reparative methods such as terminoterminal suture or graft, the major inconvenience of which consists in the necessity for prolonged clamping that would tend to produce a cerebral ischemia of more than 15 minutes.

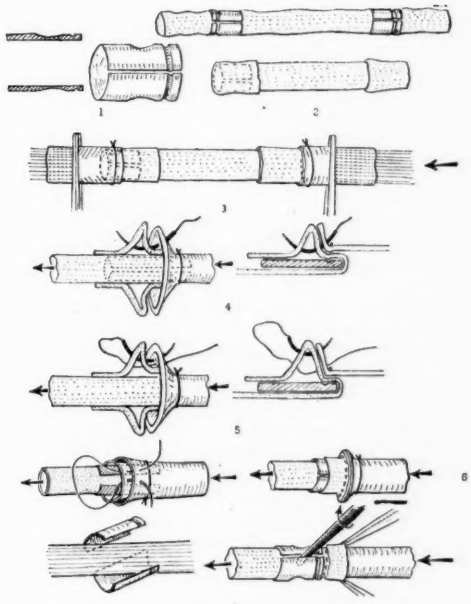


FIG. 1 (Carayon *et al.*). Technique of Fryfogle: *1*, the Fryfogle tube, *2*, the graft in place on the tube, *3*, the graft in position between the two arterial ends, permitting passage of blood, *4* and *5*, technical details of suture (original method), *5 bis*, personal modification, *6*, suture finished, and *7*, removal of the Fryfogle tube.

Other methods described which permit maintenance of the circulation during suture or graft include the procedure of Schaeffer, the preliminary shunt of Mahorner and Spencer, and those of Valentino and Fui Pei Pin, as well as the suture over removable tubes of Fryfogle and Villegas and the internal provisory intubation of Lam and Aram. All of these procedures are presented schematically. It is concluded that the Schaeffer and Mahorner procedures do not guarantee a temporary blood current adequate to prevent cerebral ischemia.

It is likewise concluded that wounds not rupturing the lumen present a serious problem and are associated with most acute accidents. Hypothermia, already employed by numerous surgeons and studied by the

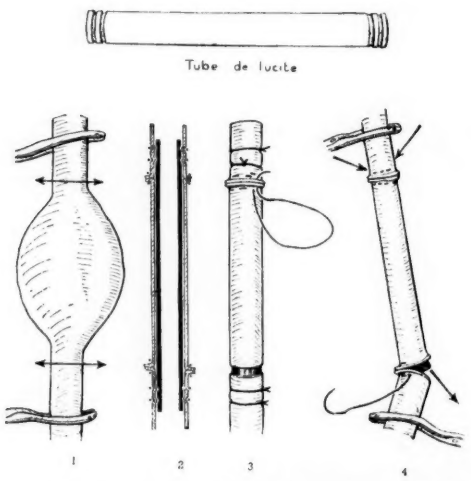


FIG. 2. Technique of Lam and Aram: *1*, resection of aneurysm, *2*, placing tube holding graft, *3*, suture of distal extremity, and *4*, proximal suture is effective only for one-half of the circumference, clamping, removal of the tube, and suture of the remaining half of the circumference.

physiologists, increases the resistance of the nervous centers to anemia and should prove a valuable adjuvant. The techniques of Valentino and Fryfogle, and Lam and Aram, which permit a terminoterminal suture or placing of a graft without interruption of the carotid blood flow are considered to be better than the methods of Shaeffer and Mahorner and Spencer. —*Edith Schanche Moore.*

Experience in a Varicose Veins Clinic. MARK SHEPPARD. *Med. J. Australia*, 1958, 2: 326.

THE AUTHOR describes an account of impressions gained by working for 10 months in a Varicose Veins Clinic at the Harrow Hospital, Charing Cross, England. The physiopathology of the varix is described and an understanding of this is considered essential for work with incompetent varicose veins. A specialized clinic with specially trained surgical nurses and physiotherapy staff is necessary. The examination for incompetent veins is described. The author believes that the Ochsner-Mahorner and Trendelenburg tests are seldom required. Venography and intravenous pressure tests are rarely used since they give little information in the majority of cases.

Patients with severe edema and subcutaneous fibrosis associated with deep vein thrombosis are considered best treated by compression therapy and massage alone. Varices and associated ulceration are treated initially by compression therapy, split skin grafting if required to hasten healing, and 2 to 3 months of elastic bandage and massage and finally stripping of the veins through relatively healthy tissues. The subfascial operation (Linton) or the extrafascial operation (Cockett and Elgan-Jones) is used only in chronic or recurrent ulcers in which removal of the fibrotic base and surrounding skin is necessary. The principles of operation include flush ligation of the diseased saphenous vein together with ligation of all tributaries, complete removal of the vein by stripping and its larger branches by stripping or excision, and eradication of additional incompetent communicating veins through separate incisions. The method of selection of patients for operation is described together with the observed results of the stripping operations. Stripping operations are considered infinitely better than other procedures. The author stresses the value of elastic compression, massage, and exercise of the leg in the treatment of varicose ulceration and deep vein thrombosis. —*Allan D. Callow, M.D.*

Dacron Vascular Prostheses (Prothèses vasculaires au dacron). NICOLAS OECONOMOS. *J. chir.*, Par., 1958, 76: 398.

THE AUTHOR briefly reviews the world literature on the use of vascular prostheses, drawing largely on the work of the Committee of the Society of Vascular Surgery studying this problem. After pointing out why dacron would theoretically appear to constitute an acceptable material from which vascular prostheses could be made, the author reports the cases of 3 patients in whom it was employed.

The first was a 28 year old female in the second month of pregnancy with a coarctation of the aorta and a poststenotic aneurysm. An 8 cm. long segment was used to replace the abnormal aorta in October, 1956. The patient had a normal delivery. An aortogram taken 10 months postoperatively showed a well functioning graft.

The second patient had a traumatic arteriovenous fistula at the level of Hunter's canal treated by replacement of the artery with a dacron graft in December, 1956. Postoperative arteriography also revealed this to be functioning well.

In May, 1957, the author used a dacron graft to perform a Blalock procedure in a patient with a severe tetralogy of Fallot. Three months after operation an aortagram revealed it to be patent.

—*J. C. Rosenberg, M.D.*

The Clinical Use of an Elastic Dacron Prosthesis. D. EMERICK SZILAGYI, LLOYD C. FRANCE, ROGER F. SMITH, and JOHN G. WHITCOMB. *Arch. Surg.*, 1958, 77: 538.

ELASTICITY in plastic arterial prostheses is a quality which tends to prevent buckling whenever the anatomical circumstances require bending, and thus aids in reducing the incidence of thromboses. Earlier the authors described a plastic tube partially composed of stretchable "Helanco" nylon yarn. Studies of this elastic nylon prosthesis revealed unsatisfactory durability, even though the patency rate was excellent. This study is concerned with a similarly constructed prosthesis made of dacron yarn.

A simple taffeta weave in which plain dacron fibers are used transversely (woof) and specially treated elastic dacron fibers are used longitudinally (warp) is utilized to fashion a seamless tube with bifurcation which can elongate 15 to 20 per cent without deformity. It is smooth walled, light and soft, and it is easy to procure, store, and sterilize. However, repeated autoclaving reduces the elasticity of the prosthesis.

The material is finely porous and the prosthesis must be "preclotted" with fresh blood to prevent marked oozing after its placement. The ends must be heat-sealed with the electrocautery. In tissue reactivity, dacron is of about the same order as teflon.

In 21 dogs a dacron prosthesis bypass was made between the upper thoracic and the lower abdominal aorta, the upper anastomosis being end-to-end. In 10 of these animals that were subjected to autopsy the formation of pseudointima was found to be satisfactory, although perhaps the formation was not as rapid as had been observed with the nylon prosthesis. Up to 9 months the tensile strength of the recovered implants was essentially unchanged. The rate of patency was excellent and tissue reactivity was low.

During a 9 month period the dacron prosthesis was used in 43 clinical cases, mainly aortoiliac, and femoropopliteal replacements. The patency rate was only slightly below that obtained by the authors with homografts. On the basis of theoretical considerations and experimental evidence the authors believe the late patency rate of these dacron prostheses will be better than that of homografts but this can be proved only after these patients have been followed up for longer periods of time. —*George R. Holswade, M.D.*

BLOOD; TRANSFUSION

Determination of Need for Blood Transfusions. CHAMP LYONS and WILLIAM F. SIMPSON. *Surg. Clin. N. America*, 1958, October, p. 1221.

THE DANGERS of serious reactions and hepatitis after blood transfusions and the rapid recovery of donors after giving 500 ml. of blood have given rise to the idea that the need for blood should be in excess of 500 ml. to justify its use. The correction of deficits in blood volume and extracellular fluid in most clinical situations may be achieved by careful bedside observations of the physical signs and routine laboratory procedures. Dosages must be individualized and there should be no blind adherence to "rule-of-thumb" formulas.

It has been noted that a loss of 20 per cent of the blood volume (1,000 ml.) is accompanied by faintness, sweating, and tachycardia. When the loss is 30 per cent (1,500 ml.) there is severe oligemic peripheral circulatory failure with markedly reduced or absent blood pressure. Any further blood loss is usually minimized by the reduced blood pressure. Therefore, in the treatment of acute hemorrhagic shock, the replacement of 1,000 to 1,500 ml. of blood should restore circulatory balance sufficiently to return the blood pressure to reasonable levels, even though the blood volume is not restored completely. Failure to respond to 1,000 ml. of blood indicates that factors other than acute blood loss alone may be in operation. Such factors are occult hemorrhage, cranial injury with cerebral damage, chest injury, and rapidly spreading invasive infections. Although blood transfusion is the keystone of resuscitation from hemorrhagic shock, often blood alone is not enough.

There is controversy over the best method of correcting a red cell mass deficit when there is an associated loss of available extracellular fluid, such as occurs in late intestinal obstructions and in the complications of peptic ulcer. In addition to restoration of the blood volume to normal the extracellular fluid deficit should be corrected, and in the case of hypochloremic alkalosis this is best done with isotonic saline solution and potassium salts. When there is massive sequestration of fluid in the fourth space with oliguria, metabolic acidosis, and hyperkalemia, Ringer's lactate solution is preferred for replacement.

There are clinical features by which the severity of oligemia may be gauged. Venous pressure is reduced and the pulse is rapid and feeble. The precordial impulse is weak. The systolic blood pressure falls and the pulse pressure narrows. An interesting feature in early shock is that the wrists and ankles are cool while the hands and feet remain warm. Later the hands and feet become cool. The urine output falls below 25 ml. per hour when the mean arterial blood pressure falls below 80 mm. Hg. There is a postural hypotension. If the patient cannot be moved, venous tourniquets about the thigh will produce further hypotension.

Extracellular fluid deficits which may accompany oligemia are manifested by changes in skin turgor, dry tongue, and reduced plasma volume.

If replacement is too rapid, the signs of vascular overload are increased venous pressure, tachypnea, and gallop rhythm.

Vasopressor drugs should be used only in hypotensive states where there is normal blood volume, and are contraindicated in oligemic hypotension.

—*George R. Holswade, M.D.*

LYMPH GLANDS AND LYMPHATIC VESSELS

The Treatment of Postmastectomy Lymphedema. BROCK E. BRUSH, JOHN H. WYLIE, JOSEPH BENNINSON, MELVIN A. BLOCK, and THOMAS J. HELDT. *Arch. Surg.*, 1958, 77: 561.

SWELLING OF THE ARM after radical mastectomy has been a problem since the beginning of radical surgery for carcinoma of the breast. Halsted believed that infection was usually the cause of swelling in arms in which the main lymphatic channels had been partially blocked by operation. Halsted also observed that the swelling was often less after skin grafting than after some plastic closures.

Methods to prevent the development of edema have included arm exercises begun immediately after surgery and continued for 6 months. Elastic arm bandages for 6 months after operation seem to have merit in the prevention of swelling. The use of constant suction to prevent postoperative fluid collections reduces the incidence of infection and thus has a role in the prevention of edema of the arm.

The authors have devised a method which they have used with heartening results in 32 patients in whom severe and disabling edema of the arm developed following radical mastectomy. The method consists of treatment by intermittent positive pressure to the arm by means of a specially fitted sleeve. Rubber tubes within the sleeve are inflated by an electrical pump with a timing device. The tubes are inflated for 15 seconds and collapse for 45 seconds. The cycle is repeated every minute for 6 to 8 hours a day for several days. After a period of treatment the apparatus may be used in the home but must be under the

supervision of a physician. When the pump is not in operation a custom-measured pressure gradient sleeve is worn.

Following this regimen the incidence of chills, fever, and localized infection was greatly diminished and pain, discomfort, and swelling were relieved in the patients treated by the authors.

—George R. Holswade, M.D.

Lymphosarcoma in Childhood. SAUL A. ROSENBERG, HENRY D. DIAMOND, HAROLD W. DARGEON, and LLOYD F. CRAVER. *N. England J. M.*, 1958, 259: 505.

SIXTY-NINE CASES of lymphosarcoma in children occurring over a 20 year period and with a minimum follow-up period of 5 years are reviewed. These cases represent 5.4 per cent of the 1,269 cases of lymphosarcoma in all age groups seen during this time. The preponderance of males to females in the childhood group was 2.6 to 1.0 as compared to 1.6 to 1.0 in the adults. The cases were classified pathologically in 61 per cent as lymphosarcoma, in 36 per cent as reticulum cell sarcoma, and in only 2 cases as giant-follicle lymphosarcoma.

Clinically cervical lymph node enlargement was the most common presenting manifestation, and this was also true in the adult patients. It is of interest that an intra-abdominal tumor was the initial manifestation in almost one-fourth of the childhood group, an incidence about twice that in the adult group. The incidence of bone lesions as the presenting manifestation was 13.8 per cent in the childhood group, a rate over 5 times that found in the adults. The clinical experience with these cases indicated that lymphosarcoma is often more locally aggressive in children. In 11 cases the disease was fatal as a result of rapid uncontrolled local disease before spread occurred.

Before treatment, anemia and thrombocytopenia were not problems as a rule, although anemia developed in most cases subsequent to treatment. Of the total childhood group, 14.5 per cent showed a transition suggesting a leukemic change. Of the 42 cases of small cell lymphosarcoma, leukemia developed in 9. When lymphosarcomatous processes invade the bone marrow, a true lymphatic leukemia apparently develops with all the implications of compromised bone marrow function and probable incurability. In childhood a picture of acute leukemia usually supervenes in these circumstances. Solitary reticulum cell sarcoma presenting in bone appears in a distinctly younger age group than does generalized reticulum cell sarcoma. Often this tumor is quite radiosensitive and metastasizes late, thus justifying aggressive extirpative therapy. Three of the 10 surviving children in this series are from this group.

The treatment of lymphosarcoma remains unsatisfactory, but the judicious use of radiotherapy remains the backbone of treatment and can relieve symptoms and prolong life in many situations. The use of polyfunctional alkylating agents alone or with adrenal steroids has been of very little value. The antimetabolic agents, chiefly the folic acid antagonists, have been more useful, particularly in children with acute leukemia. Supportive therapy including blood transfusions, antibiotics for specific infections, and surgical correction of obstructions to the intestine or trachea are important as temporary life saving measures. When the disease appears in the form of a unicentric apparently localized process, all efforts at eradication by surgical or radiotherapy should be utilized. Radical surgical procedures were performed in 8 of the children in this series and there were 2 long term survivors.

The survival curve of the study group shows that 50 per cent of the children were dead in 7.5 months, as compared to 27 months for the adults; 37.7 per cent were alive at 1 year and 23 per cent at 2 years, as compared to 72 per cent and 54 per cent respectively for the adult group. The 5 year survival rate was 17.4 per cent in children and 27.7 per cent in the adult group.

Although the disease is more aggressive in children than in adults, the incidence of long term survivals is nonetheless considerable and does not justify the hopeless attitude so prevalent among physicians.

—E. Thomas Boles, Jr., M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Surgical Considerations in the Treatment of Closed Traumatic Lesions of the Abdomen (Considerazioni sul trattamento antishock e sui problemi anestesiologici, in vista dell'intervento chirurgico, nelle lesioni addominali da traumi chiusi). ENRICO RESEGOTTI. *Riforma med.*, 1958, 72: 1064.

THE AUTHOR reports the cases of 22 patients with abdominal trauma treated at the University of Pavia in the period from 1951 to 1957. All of the patients required abdominal surgical intervention. There were 9 with a ruptured spleen, 2 with liver damage, and 1 with involvement of the kidney. There were 10 with involvement of the gastrointestinal tract, 7 with perforated intestines, and 3 with hemorrhage and hematoma of the mesentery.

The author recommends adequate antishock therapy and replacement of the blood volume with rapid and massive transfusions, if necessary, before resort to surgery. In doubtful cases early surgical exploration is recommended. General anesthesia is usually necessary and intubation is preferable.

—*Lucian J. Fronduti, M.D.*

Operative Fluid Loss. EBBE KRAGELUND. *Acta. chir. scand.*, 1958, 115: 249.

THIS STUDY was aimed at determining the fluid loss occurring during operative procedures through the respiratory tracts, evaporation from the skin, and exudation from the wound surfaces. The loss was determined by weighing the patients before and after the operative procedure. The bed scale was accredited with being accurate within 50 gm. Correction was made for parenterally administered fluids, bandages, catheters, and weight of the surgical specimen. Blood loss was separately measured.

It was determined that exudation from wound surfaces, particularly coelomic cavities, had a protein content similar to that of plasma and as a result of these particular studies, the author arrived at a formula by which he would give 500 ml. of human serum to each 1,000 ml. of whole blood, the amount of whole blood being determined by the exact amount of blood lost.

The studies indicate that in major surgical procedures, a plasma loss amounting to from 400 to 600 ml. must be expected to occur through traumatized wound surfaces. —*Ward D. O'Sullivan, M.D.*

Postsurgical Anuria; An Experimental Study of Fluid and Electrolyte Changes. B. F. RUSH, JR. and H. T. RANDALL. *Surgery*, 1958, 44: 655.

THE PURPOSE of this study was to measure and evaluate the shifts of fluid and electrolytes that occur in acute and total anuria following surgical procedures. Anuria was created in mongrel dogs by ligation of the ureters. Studies of intracellular and extracellular fluid spaces and electrolytes were done before and usually 72 hours after the onset of anuria. In all but one dog the fluid intake was restricted to approximately one-half of the insensible loss.

During anuria the total extracellular sodium, chloride, carbon dioxide, and pH decreased. The extracellular potassium, phosphate, magnesium, and the intracellular sodium and chloride increased. With fluid restriction the plasma volume decreased, the inulin or sucrose space decreased both in the entire animal and in muscle biopsies, and the intracellular water increased.

Balance studies indicated that the loss of chloride from the extracellular fluid could not be accounted for in extracorporeal losses. The total available body potassium remained the same before and during anuria. It was thought that under the conditions of these experiments there is a shift of fluid and electrolytes from the extracellular space into the cells with extracellular dehydration, hyponatremia, and hypochloremia correlated with intracellular edema, hypernatremia, and hyperchloremia.

—*W. Foster Montgomery, M.D.*

Nasogastric Intubation; Indications, Complications, Safeguards, and Alternate Procedures. E. LEE STROHL, PAUL H. HOLINGER, and WILLIS G. DIFFENBAUGH. *Am. Surgeon*, 1958, 24: 721.

NASOGASTRIC INTUBATION will be among the significant contributions to surgery of the twentieth century when such appraisals can be properly documented. However, complications including abscess of the nasal septum, otitis media, sinusitis and hoarseness, ulceration and stenosis of the esophagus, rupture of esophageal varices, knotting of the tube and inability to withdraw the tube, and fluid and electrolyte depletion must be recognized as complications. Safeguards to prevent such complications and consideration of temporary gastrostomy as an alternate procedure, especially in children and elderly patients, must receive proper evaluation.

The circumstances which prompted the development of nasogastric suction are rapidly disappearing with the antibiotic drugs and early surgery, and it is time for the surgeon to re-evaluate the indications for use in each patient. —*W. Foster Montgomery, M.D.*

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Third Degree Burns of the Dorsum of the Hand. JOHN A. MONCRIEF. *Am. J. Surg.*, 1958, 96: 535.

BURNS OF THE hand make up an alarmingly high percentage of thermal injuries. The burned patient frequently sustains involvement of the hand as a result of protective action in an attempt to cover his face or eyes, or in an effort to extinguish a flame elsewhere on his body. The depth of the burn will vary with the cause, but even a flash burn often causes full-thickness loss on the dorsum of the hand. Third degree burns of the palmar surface are rare unless caused by

electricity, chemicals, or grasping a hot object. Burns of the flexor surface of the tips of the fingers or the margins of the thenar or hypothenar areas are frequently third degree, but the remaining area of the hand, particularly the palm, sustains full thickness skin loss only under the most unusual circumstances.

On the dorsum of the hand the small amount of subcutaneous tissue, and the relatively thin skin are contributing factors to full thickness loss. These same factors also contribute to easy destruction of the skin on the dorsum of the digits. The most readily involved of the deeper structures is the extensor mechanism from a point at the midlevel of the metacarpals through the distal interphalangeal joint, particularly over the metacarpophalangeal joint and the proximal interphalangeal joint. In addition, the joint capsule of the interphalangeal joint may be destroyed in the dorsal area. Even though destruction is not complete, fibrosis and scar may cause marked limitation of the joint. Phalanges may sustain a burn sufficient to devitalize the periosteum and destroy the overlying tissues. Persistent edema from the thermal injury may cause a woody induration in the intrinsic muscles of the hand, particularly those in the thenar space.

The thermal injury itself is immediate, and not progressive. Infection, however, may completely disable a hand that was functionally useful right after the thermal injury, and a partial thickness injury may be converted into a full thickness one. If the extensor mechanism is still intact following the burn, even though full thickness loss of skin has occurred, this delicate mechanism may be subsequently destroyed by autolysis resulting from bacterial proliferation. Such a condition is apt to occur in the area of the middle slip of the extensor tendon at the proximal interphalangeal joint, and at the point where the extensor tendon passes over the head of the metacarpal bone near the metacarpophalangeal joint.

If the extensor mechanism, the joint capsule, or the joint is destroyed by the thermal injury, fusion of the joint in the maximum position of function is the only treatment for restoring any functional use of the hand. Skin coverage should then be attempted. Frequently exposure of the phalanges results in amputation. In some instances granulation may be stimulated by drilling the bone; however, the result is not fully functional.

The usual method of treating burns does not prevent the autolytic bacterial destruction of the extensor mechanism beneath the third degree eschar. Therefore, early excision of the burn with prompt split-thickness grafting is desirable. Surgical excision very early—after 18 to 24 hours—results in excessive edema and poor survival of the grafts. The optimum time for excision seems to be after 48 to 72 hours have elapsed.

Excision is carried out under tourniquet ischemia, and brachial block or general anesthesia. It must be carried to a depth sufficient to remove all devitalized tissue; if the vessels in an area are not thrombosed the tissue is probably viable. An attempt should be made to preserve the venous network and perivascular lymphatics, to prevent edema after grafting. The peritenon must be carefully preserved, and this may be particularly difficult in the region of the metacarpophalangeal joint.

Even though the extensor mechanism is preserved, subsequent function may be impaired by improper placement of the lines of excision. Excision is carried to the midlateral position on the fingers, with dartlike palmarward projections at the interphalangeal joints. The interdigital web spaces and the thenar space must be excised to prevent postoperative webbing.

Grafting is usually delayed and carried out 48 to 72 hours following the excision. Pressure dressings are used along with elevation to prevent edema formation in this interim.

Donor skin is best obtained from the chest, abdomen, and the anterior-medial part of the thigh where the skin is relatively thin and, as a consequence, a thick graft is more elastic. Grafts are taken at thicknesses of 0.020 to 0.025 inch and applied without tension. Junctional scars should be placed transversely. A pressure dressing is applied for 3 days. The sutures are then removed and another pressure dressing is applied. This is removed on the sixth day, and the hand is elevated. Physiotherapy is begun 8 to 10 days after grafting. When the hand is not in use, elevation must be maintained to prevent edema and woody induration of the intrinsic muscles.

The authors report a series of 27 full thickness burns treated by early excision and split grafting. The application of sound surgical principles is outstanding. The excellent results to be obtained from the early and proper application of split grafts to badly burned hands deserves wider recognition and application.

—Carl H. Calman, M.D.

Mortality Rates in Patients with Burns; A Report of Experience at the San Francisco City and County Hospital 1943-1956. Albert G. Clark and J. Harold Hanson. *California M.*, 1958, 89: 210.

The authors review the cases of 93 patients with burns covering more than 20 per cent of the body surface who were treated at the San Francisco City and County Hospital between 1943 and 1956. The mortality rate increased from 40 per cent during the 1943 to 1947 period to 69 per cent in the period from 1952 to 1956. In the early series 69 per cent of the deaths occurred within 48 hours of admission and resulted from shock. In the 1952 to 1956 period only 19 per cent of the deaths occurred within the first 48 hours and during this period the major cause of death was infection.

The time of grafting in both series was essentially the same. The authors concluded that differences in local treatment had little effect on mortality. No patient more than 50 years of age who had burns of 25 per cent of the body surface survived and only one patient with burns that involved 45 per cent of the surface survived. No patient who had a blood culture which was positive for bacteria survived, and the use of antibiotics had no effect on the incidence of infection. During the period covered by this study there was an increase in resistant organisms and in organisms causing serious and fatal disease that had previously been considered nonpathogenic or of very low virulence The authors recommend in view of the steady increase in the mortality rate in burn patients, which is primarily due to infection, that separate

wards be established for these patients. Isolation technique should be used and hospital personnel assigned to the burn ward should not be permitted to care for other patients. The use of antibiotics prophylactically had no effect on the incidence of infection and it was recommended that these drugs be reserved for therapeutic use only. —*Gordon Madding, M.D.*

Wound Healing in the Paraplegic Patient. S. ARTHUR LOCALIO, EDWARD W. LOWMAN, and JAMES GIVSON. *Surgery*, 1958, 44: 625.

A STUDY was carried out on 11 male paraplegic patients by the sterile excision of approximately 400 sq. mm. of full-thickness skin from the upper chest and upper thigh to demonstrate the ability of the patients to heal in normal and in denervated areas. Denervation paraplegia was not found to be a deterrent to healing but rather an invitation to ischemic pressure necrosis. The delay in healing observed in decubiti was found not to be due to the failure to heal but rather to reinjury by painless pressure trauma.
—*W. Foster Montgomery, M.D.*

Control of Surgical Infections at the Minneapolis General Hospital. CLAUDE R. HITCHCOCK, HELEN HARDER, MARGARET PANUSKA, MAE COLLINS, and Others. *Surgery*, 1958, 44: 492.

THIS ARTICLE is essentially a description of the experience of the Infection Committee at the Minneapolis General Hospital during a 25 month period beginning in November, 1955. In the early phases of the investigations of this committee attempts were made to find the factors responsible for infections in clean surgical cases. As these factors were delineated, efforts to counteract them were taken and the results insofar as the wound infection rate is concerned were noted.

Initial studies were made concerning the problem of cross infection, particularly with the Staphylococcus organism, in the operating suite newly equipped with an air conditioning and cooling system. These studies demonstrated that this air conditioning system itself was not responsible for introducing organisms into the area, but that such organisms were introduced into the operating room area by patients and professional personnel. A second study involving cultures of the hands of the members of the operating team indicated that the scrubbing techniques in use were apparently satisfactory. It is also significant that in this hospital there is an ironclad rule that everyone who enters the operating room must be properly gowned in scrub suits or dresses.

The previous preparation of the skin of the operative area had been: (1) shaving of the area of the operation and a 10 minute scrub with pHisohex the night before surgery, and (2) an additional scrub with pHisohex in the operating room immediately followed by four applications of tinted aqueous zephiran. As this procedure was thought to be unsatisfactory in some cases, it was changed to:

1. Shaving of the area the night before surgery and scrubbing with pHisohex for 10 minutes.

2. The following day the operative area was thoroughly washed 4 times with ether, with the patient still on the litter.

3. The patient was then moved into the operating room and placed on the operating table, and the area was washed 5 times with 70 per cent alcohol.

4. The operative area was then painted with 5 applications of tincture of zephiran.

Unfortunately, no data regarding the ineffectiveness of the first listed technique of skin preparation were given.

In addition to the changes made in skin preparation, a number of changes were also made in techniques in the ward. These included:

1. Improved technique for wound dressings.

2. The use of gloves in examination of colostomies and ileostomies.

3. Discard of wound dressings after the first 24 hours.

4. Segregation of patients with infections insofar as possible to one area in the wards or hospitalization in the contagion service.

5. The use of brooms was discontinued and the floors were cleaned only with oil or water mops.

6. Interchange of extra blankets and any other items incident to the care of patients was stopped.

7. Cast cutter heads and other equipment of this type were sterilized after each using.

8. Strict gowning and masking techniques around infected and isolated patients were enforced.

It is of interest that 22 of the 35 Staphylococcus organisms studied during this period had identical sensitivity patterns and presumably were of the same strain. This highly resistant "hospital" strain was considered indigenous to this hospital.

During the 9 month control period 1,374 operations were performed on the "clean" services and 41 postoperative wound infections occurred, an infection rate of 2.98 per cent. During the 5 months following the institution of the controls noted there were 806 operations with only 4 postoperative wound infections, an infection rate of 0.4 per cent in the clean cases. In the ensuing 12 month period there were some monthly variations in the infection rate, but the average was less than 2 per cent.

The authors think that the changes in skin preparation prior to surgery were probably the most significant factor that they were able to alter in achieving a reduction in the infection rate in the clean surgical cases. The importance of an infection committee, periodic survey of the infections, and the apparently responsible factors is stressed. It is essential to keep a constant vigil against all factors possibly responsible for cross infections if this rate is to be kept at a satisfactory level. —*E. Thomas Boles, Jr., M.D.*

The Effect of Antimicrobial Drugs on the Staphylococcal Flora of Hospital Patients. VERNON KNIGHT, ARTHUR C. WHITE, and MARGARET P. MARTIN. *Ann. Int. M.*, 1958, 49: 536.

A STUDY of the mechanisms responsible for the development of drug resistant staphylococci and their persistence in hospital patients with antimicrobial therapy is reported. Hospital patients and personnel receiving treatment with tetracyclines and penicillin were found to be the chief source of drug resistant staphylococci of phage group III and of phage type 80/81 in the hospitals at the present time.

The antimicrobial drugs influence the characteristics of staphylococci carried by patients and may temporarily suppress the carrier state, but they do not appear to affect the tendency of a host to be a carrier. The carrier state often coexists with clinical staphylococcal infection and it is suggested that both are strongly influenced by host factors which are unrelated to antimicrobial therapy. The control of staphylococcal resistance might be approached by the periodic withholding of certain drugs from use in hospitals to preserve their antistaphylococcal effect. The antimicrobial susceptibility test should be used as the guide. —*W. Foster Montgomery, M.D.*

The Treatment of Actinomycosis (Zur Aktinomykose-Behandlung). KURT W. BRÜECKEL. *Deut. med. Wschr.*, 1958, 83: 1549.

A 57 YEAR OLD WOMAN entered the hospital, complaining of lancinating pains in the right chest. She was emaciated, febrile, and had very badly infected teeth. Her illness had developed gradually during the preceding year.

Roentgenologic examination revealed fluid in the right pleural cavity, reaching from the base to the apex and extending between the lobes. The fever and pleural effusion disappeared after a few days of treatment with penicillin and streptokinase-streptodornase. After 14 days the cultures of the pleural fluid showed a growth of anaerobic actinomyces Wolff-Israel. Treatment was continued with penicillin and a sulfonamide. Several teeth were extracted and the root abscesses of 3 of them disclosed actinomyces Wolff-Israel. Tetracyclin was given following the extractions, and then oleandomycin. Three weeks after the extractions there was a recurrence of the febrile condition, accompanied by marked polyarthritic manifestations and severe iritis with secondary glaucoma in the left eye. These symptoms regressed under treatment with prednisone but the sight of the left eye could not be saved.

Actinomyces are sensitive to almost all of the antibiotics, but the sulfonamide was added in the early treatment on the chance that the invading organism might be the penicillin-resistant Nocardia asteroides.

It is recommended that antibiotic treatment of actinomyces be started early and that saprophytic pockets in the teeth and throat be looked for. Vaccine therapy is considered of value in the convalescence as a prophylactic measure against recurrences, and as a provocative method in the differential diagnosis. Polymyxin-B therapy might also prove of value in diagnosis, in that it should clear up the mixed infections and leave the actinomyces unchanged.

—*John W. Brennan, M.D.*

Severe Tetanus, Hibernation and Recovery (Tétanos grave, hiberné et guéri). ARMAND GENEST, GÉRARD MIGNAULT, and MAURICE SAINT-MARTIN. *Union méd. Canada*, 1958, 87: 1017.

A MAN 23 years of age, flying a kite for his son, was using several hundred feet of steel wire instead of string. The wire contacted a high tension electric circuit. His hands shriveled up on the spool and he was thrown to the ground in opisthotonus, the current passing out through the occiput.

He was taken to the hospital unconscious and, following preliminary treatment, requested to be taken to Montreal where he arrived in a moribund condition, with deep wounds of his hands, elbows, back, and in the parieto-occipital region. In the following week the wounds on his left hand and elbows were ready for grafting. The right hand had to be removed at the first dressing. The right wrist was grafted to the abdomen. An occipital craniectomy was done for the completely devitalized occiput and the exposed brain was covered with a flap rotated from the scalp, a dermoepidermal graft being used to close the donor site. The right wrist was then detached from the abdomen with a flap for closure of the amputation wound. So far the treatment had been successful and the patient was believed to be saved when a rapidly progressive trismus developed.

Following a diagnosis of tetanus appropriate treatment was instituted. After a consultation, the tetanus team decided to try artificial hibernation, following nasotracheal intubation to permit tracheotomy for the prevention of suffocation and possible pulmonary complications. A polythene catheter was introduced up to the subclavicular vein, and the patient was transferred to the hibernation division. Neurovegetative disconnection began with glucose solution (5 per cent in 500 c.c.), to which was added 50 mgm. of pacatal, 50 mgm. of phenergan, 100 mgm. of demerol, and sodium gardenal (20 ctgm.) intramuscularly in 4 hrs. To relieve muscular tension suppositories of curare (3 mgm.) were administered every 4 hrs. Vitamin B_1 and B_6 (100 mgm. each) were administered intramuscularly daily. The patient was placed bare on his bed in a surrounding temperature of 65 to 68 degrees F. One cubic centimeter of a mixture containing 50 mgm. each of pacatal, phenergan, demerol in 5 c.c., was injected intravenously upon recurrence of the contractures. His rectal temperature fell gradually to 101 degrees F. with 5 per cent glucose in 500 c.c. of water after 8 hours. He received 100,000 units of antitetanus serum intravenously, 500,000 units of penicillin intramuscularly, and 200 mgm. of achromycin intramuscularly after 6 hrs. He was changed from one lateral position to the other every 2 hours to prevent passive orthostatic pulmonary congestion and to favor alternate drainage of the lungs. His temperature, blood pressure, pulse, and respiration were checked every half hour and he was kept under constant observation. Oropharyngeal, nasopharyngeal, tracheal, and bronchial aspirations were made regularly as required. The urinary output was controlled with a catheter and a fluid diet was injected through a Levin tube, 50 to 60 c.c. every 2 hours day and night.

Neurovegetative disconnection was gradually effected. The patient rested and the convulsions became less frequent. The specific therapy was continued for the next 4 days, namely, penicillin-achromycin-antitetanic serum, 40,000 units, was given every 6 hours, alternately intramuscularly and intravenously, also pacatal (100 mgm.), phenergan (100 mgm.), demerol (200 mgm.) every 24 hours; sodium gardenal was given intramuscularly, 120 mgm. every 24 hours and a suppository of 12 mgm. of tubocurarine was given every 24 hours. The convulsions became more violent

with an attack of opisthotonus. Hibernation was then increased and the dose of pacatal-phenergan-demerol was doubled. Food was temporarily discontinued. Thereafter the patient gradually improved and his diet was increased. Two years later a fairly large meningocele was corrected.

Success in this case was attributed to the work of a tetanus team including an anesthetist, bacteriologist, plastic surgeon, neurosurgeon, and internist, with the use of hibernation in addition to the classical methods of treatment for tetanus. —*Edith Schanche Moore*

Clinical Experiences with Kanamycin. PAUL A. BUNN and ALDONA BALTCH. *N. England J. M.*, 1958, 259: 659.

KANAMYCIN is a new antibiotic effective against both gram positive and gram negative organisms. The drug is not absorbed very well from the intestinal tract and must be administered intramuscularly. Overt allergic reactions have not yet been reported. Toxicity appears to be small with even large doses, 2 to 3 gm. daily, when the period of administration is 4 to 14 days. However, with prolonged administration, even though the dose be smaller, 0.25 to 1.0 gm., untoward side effects appear in nearly all patients in the form of hyaline and, later, granular casts and eosinophilia. No irreversible renal damage has been observed. Eighth nerve toxicity may occur, but has not as yet been clearly defined.

Fifteen staphylococcal infections were treated with doses of 1.5 to 2.0 gm. daily. All of the patients were severely ill, and 6 had positive blood cultures. In all infection was judged to be progressing at the institution of therapy. The diseases included pneumonia, intra-abdominal abscess, acute exacerbations of osteomyelitis, and multiple skin abscesses. All patients had associated debilitating disease, and a poor prognosis. Most had had prior antibiotic therapy with failure to control the infection. Of these patients 2 ultimately died. The remainder responded satisfactorily, some very impressively. Drainage procedures were done in 7.

Ten patients with gram negative bacillary infections were also treated. The etiological organisms were the Escherichia coli, Proteus, and Pseudomonas. In 4 of these the infection was considered life-threatening, and in none of them had previous antibiotic treatment been of avail.

Three patients had positive blood cultures, and in these antibiotic response was striking. Eight of them had a satisfactory response, one died from Pseudomonas pneumonitis, and one from a Proteus urinary tract and lung infection.

Kanamycin is definitely useful in certain human infections. Absorption from intramuscular depots, and rapid excretion require that it be administered two and, preferably, four times daily. It inhibits impressively in vitro the growth of a wide range of pathogens including the Staphylococcus, most strains of the Proteus, Escherichia coli, Klebsiella, Aerobacter aerogenes, the tuberculosis bacilli, and some strains of the Pseudomonas. The limited clinical experience recorded here suggests that clinical utility of Kanamycin may parallel that suggested in the laboratory.

—*Carl H. Calman, M.D.*

ANESTHESIA

Postoperative Analgesia with R 875. A Comparison of the Effects of Dextro 2,2-Diphenyl-3-methyl-4-Morpholinobutyrylpyrrolidine and Morphine in Man. VIGGO DYRBERG and ERIK WAIN ANDERSEN. *Acta. chir. scand.*, 1958, 115: 243.

THE AUTHORS, from Denmark, prepared a clinical study of the analgesic effect of diphenylpropylamine R 875 as contrasted to that of morphine in the control of postoperative pain. Following operation, with a double blind technique and evaluation of the patient's symptoms by trained technicians or medical students, the effectiveness of R 875 and morphine were contrasted, both as to the relief of pain and duration of such relief.

R 875 was found to be slightly more effective than morphine as an analgesic agent when both drugs were employed in doses of 10 mgm. The duration of action was similar to that of morphine. No conclusion could be reached concerning the incidence of side reactions.

—*Ward D. O'Sullivan, M.D.*

Positive-Negative Pressure Ventilation with a Modified Ayre's T-Piece. E. I. EGER and W. K. HAMILTON. *Anesthesiology*, 1958, 19: 611.

A SIMPLE, COMPACT, INEXPENSIVE DEVICE is described which will develop a controllable degree of negative pressure and can be used to produce a negative phase in ventilation in all conventional systems. The device incorporates the Bernoulli principle into an Ayre's T-piece so as to permit the development of a negative pressure in one limb of the T-tube when gases are driven through the stem. The authors name this tube the Bernoulli T-tube (BT tube).

A small tube or needle is bent at a 90 degree angle and is placed in the Ayre T-tube so as to be the only passageway between the stem and bar. Gases flow through the needle and create a negative pressure in the portion of the bar behind the jet of existing gases. This effect is based on the Bernoulli principle that the velocity of the gases through the tube is inversely related to the pressure of the gas against the side of the tube. The negative pressure developed is a direct function of the jet velocity and of the density of the gases in the jet and is an inverse function of the area surrounding the jet. Pressures of -5 to -15 cm. of water are developed with a jet flow of 3 to 5 liters per minute. The gases used to develop the negative pressure are the same gases used to maintain anesthesia.

Clinically the BT tube may be used in any of the conventional systems (circle or to-and-fro) to produce a controllable negative phase in controlled or assisted ventilation. If an appropriate Bernoulli tube is chosen, it will offer little resistance to spontaneous respiration when not in function. —*Mary Karp, M.D.*

Fluothane and Other Nonexplosive Halogenated Hydrocarbons in Clinical Anesthesia. G. D. DIXON and D. I. MATHESON. *Canad. M. Ass. J.*, 1958, 79: 359.

THE PURPOSE of the authors was to determine the value of fluothane in anesthesia. The physical, chemical, and pharmacological properties are reviewed and compared with chloroform and trichlorethylene. Serious toxic reactions affecting the liver and cardio-

vascular system seem to be rare if concentrations of fluothane from 1 to 1.5 per cent are used. It is a potent anesthetic, about four times as potent as ether, and is an intermediary, being less toxic than ether and more potent than trichlorethylene.

Fluothane was used in 3,000 cases at the Toronto Western Hospital. The usefulness of various methods of anesthesia administration is discussed, also their advantages and disadvantages, and their indications and contraindications. The authors conclude that fluothane is a safe, yet potent, agent because of its nonexplosiveness and lack of unpleasant side effects and that it deserves a prominent place in modern anesthesia. —*Mary Karp, M.D.*

Fluothane Sensitization of the Dog Heart to the Action of Epinephrine. KENNETH D. HALL and FORBES H. NORRIS, JR. *Anesthesiology*, 1958, 19: 631.

EXPERIMENTS were set up to study the role of fluothane in epinephrine-induced arrhythmia in the dog heart in an attempt to determine its toxicity on the heart. Intravenous and intramuscular doses of epinephrine and norepinephrine were given to 37 dogs under various conditions. It was found that fluothane increased the sensitivity of the dog heart to the effect of epinephrine and norepinephrine, whereas thiopental did not. When these drugs were used intramuscularly a serious, but never fatal, arrhythmia occurred under fluothane. It required 159 times the intravenous dose to produce a similar effect intramuscularly.

Hypoxia and hypercapnia did not play a significant role in the increased sensitivity of the heart to the effect of epinephrine in this series. Respiratory depression from fluothane anesthesia and the hypertensive effects of the epinephrine did not seem to play a significant part in the increased cardiac sensitivity.

Since the large dose of epinephrine used in the experiment would never be used clinically there does not seem to be an absolute contraindication to the use of fluothane and epinephrine in normal healthy patients. It is suggested, however, that epinephrine be omitted in the presence of cardiovascular disease —*Mary Karp, M.D.*

SURGICAL INSTRUMENTS AND APPARATUS

Single Use Disposable Disc Oxygenator for Open Heart Surgery. WILLIAM G. ESMOND and R. ADAMS COWLEY. *Am. Surgeon*, 1958, 24: 685.

THE AUTHORS report their experience with a modified Kay-Cross disc oxygenation system in open heart surgery as favorable except for the excessive time required to clean and assemble the equipment. An efficient expendable rotating disc oxygenator designed for mass production is described. It may be gas-sterilized and is pyrogen-free with all tubing and necessary filters for use in the pump-oxygenator system disposable. The oxygenator consists of two draw formed half shells of methylmethacrylate which fit together to form a cylinder with proper fittings in each end to receive and discharge the blood and gas. A deep well on the discharge end of the oxygenator insures that bubbles will not be introduced into the stream of the oxygenated blood. The discs are injection molded from methylmethacrylate. The bubble trap and coronary return units consist of two half shells of methylmethacrylate plastic cemented together with a screen separating the two halves. In use, the oxygenator units are provided in boxes completely sterile and pyrogen free with all tubing in place.

The use of this equipment will greatly simplify and expedite the preparation of the pump-oxygenator for open heart surgery and the ease and ready availability of this equipment suggest application to other surgical and medical problems.

—*W. Foster Montgomery, M.D.*

Experimental and Clinical Studies of Controlled Hypothermia Rapidly Produced and Corrected by a Blood Heat Exchanger During Extracorporeal Circulation. IVAN W. BROWN, JR., WIRT W. SMITH, W. GLENN YOUNG, JR., and W. C. SEALY. *J. Thorac. Surg.*, 1958, 36: 497.

USING MONGREL DOGS anesthetized with intravenous sodium pentobarbital the experimenters studied body temperatures with thermistor needles or probes inserted into the cerebral cortex, right side of the heart, midesophagus, liver, kidney cortex, rectum, and thigh musculature. Studies were made of the cooling and rewarming velocities of various organs and tissues. It was found that the heart, liver, and kidneys cool and rewarm most rapidly and at essentially the same rate when hypothermia is produced and corrected by this method. The brain and midesophagus cool and rewarm at only a slightly slower rate. It was found that the midesophagus temperature most closely reflected the other vital organ temperatures. In both animals and man it has been possible to lower the temperature from 37 degrees to 30 degrees C. in a matter of a few minutes and to maintain evenly a chosen hypothermic temperature level to within 0.5 degree C. Rewarming from 30 degrees to 35 degrees C. has been accomplished at only a slightly slower rate than that of cooling. Oxygen saturation values of venous blood from the brain, right side of the heart, liver, kidney, and leg in the hypothermic dog, maintained by a pump-oxygenator, show good relative correlation with the mixed venous blood oxygen values. Hypothermia produced by a blood heat exchange method and its combination with extracorporeal circulation has been employed in 27 patients undergoing open heart surgery. —*W. Foster Montgomery, M.D.*

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Visualization of the Coronary Circulation by Occlusion Aortography: A Practical Method. CHARLES T. DOTTER and LOUIS H. FRISCHE. *Radiology*, 1958, 71: 502.

THE AUTHORS present their method of visualizing the coronary circulation and several illustrative cases with the hope that some successful surgical attack on coronary artery disease may be the reward of these studies. In the present technique a double lumen balloon catheter is used for injection of small quantities of thorotrast close to the orifices of the coronary arteries during a period of brief occlusion of the aorta just distal to the site of injection. Studies have been made in animals, as well as in human beings. —*Morris Horwitz, M.D.*

The Value of Cinematography in the Diagnosis of Malignant Strictures of the Esophagus. F. R. BERRIDGE and D. McC. GREGG. *Brit. J. Radiol.*, 1958, 31: 465.

THE DIFFERENTIATION of malignant from benign strictures of the lower esophagus by means of the conventional barium swallow is often difficult, if not impossible. Benign conditions in which confusion may arise include achalasia, stenosis due to peptic esophagitis, scleroderma, diffuse muscular hypertrophy of the lower esophagus, lower esophageal ring or web, and strictures due to the swallowing of corrosives.

For the past 2 years the authors used cineroentgenography in all cases of stricture of the lower esophagus of doubtful etiology to establish a correct differential diagnosis. During these 2 years they encountered 7 cases of stricture of the lower esophagus which could not be classified following examination with the orthodox barium swallow. Cineroentgenography led to the diagnosis of cancer in 5 of these cases, 1 was almost certainly malignant, and the last proved to be benign at operation. During the same period 12 patients with achalasia, 9 with stricture due to esophagitis, 1 with a corrosive stricture, and 2 with congenital stricture were examined. The authors know of no case of malignant lesion of the lower esophagus which has been missed by this method.

Cineroentgenography is performed in both oblique positions with the patient standing and lying down, while he stops breathing. Undiluted micropaque barium suspension is used and the camera is run at 8.3 frames per second.

The diagnosis of malignancy is based on the following criteria: (1) the wall of the esophagus is quite immobile where it is infiltrated by the malignant neoplasm; (2) when the narrowing is great, the barium forces the walls of a malignant stricture apart for a brief period and the walls immediately come together again, although this phenomenon may also be found in achalasia; (3) the bolus is always temporarily held up when it reaches a malignant stricture, but in benign strictures caused by peptic stenosis the delay may be very short; (4) the mucosal pattern is obliterated in malignant strictures and sometimes in peptic esophagitis, but not in achalasia; (5) the portion of the esophagus near the lesion moves normally in malignant strictures and in peptic esophagitis, whereas in achalasia, except the very early cases, the movements of the esophagus may be entirely brought about by transmitted cardiac pulsations and the effect of respiration; (6) malignant strictures do not straighten on full inspiration, whereas benign strictures may do so; and (7) cardiac and aortic pulsations tend to move a malignant stricture backward and forward, whereas in benign strictures the heart tends to indent the esophagus rather than to displace it.

The relevant points in the 5 cases correctly diagnosed as malignant strictures are described and illustrated with beautiful cineroentgenographic reproductions in the original article. A differentiation from benign stricture was possible in every case. The authors concede that inflammatory strictures may become malignant and the two conditions may be present together, in which case a sharp distinction would be impossible. However, such a combination is not very common, and even if it does occur, cineroentgenography would be apt to lead to a more accurate diagnosis than the usual barium swallow or esophagoscopy. —*T. Leucutia, M.D.*

A Discussion of Roentgenological Findings in Patients after Gastrectomy (Ueber postoperative Roentgenbefunde nach Gastrectomie bzw. Cardiaresection). G. BECK. *Fortsch. Roentgenstrahl.*, 1958, 89: 291.

AFTER STUDYING schematic illustrations of the most commonly performed gastric operations and the appearance of normal roentgenograms, the author discusses postsurgical complications. Various types of suture insufficiencies and their recognition on the roentgenograms after the ingestion of barium are discussed in detail. An abscess has been frequently observed shortly after surgery; it may heal spontaneously or form a permanent fistula. The difficulty of differentiating mural implants and recurrence of the ulcer from a normal mucosa fold is mentioned.

The importance of postoperative roentgenograms is emphasized; these should be taken prior to the patient's discharge from the hospital. They should always be compared with the roentgenograms taken prior to surgery for reference. The exact knowledge of the type of operation performed is also imperative for proper evaluation of the roentgenograms.

—*George B. Wichman, M.D.*

Modern Trends in Diagnostic Roentgenology of the Colon. The Mackenzie Davidson Memorial Lecture. SÖLVE WELIN. *Brit. J. Radiol.*, 1958, 31: 453.

IN THIS lecture, delivered at The British Institute of Radiology on April 17, 1958, the author discusses the present day trends of roentgenologic examination of the colon with special emphasis on the question

whether routine double contrast examination is worth while in the investigation of bowel trouble. In fact, this topic forms the main part of his address.

The author begins with a historical survey of the various refinements and modifications brought about in the barium enema study of the colon since 1933. Among these are the use of a semitransparent medium by Ledoux-Lebard and Garcia-Calderon (1933); overexposure of the films by Rigler and Eriksen (1936); high voltage technique, first with 100 kv. and now with 120 kv., by Gianturco (1936); the addition of tannic acid to the contrast enema, or the George Sackett method (introduced in America by John B. Hamilton (1946) and fully endorsed by Christie, Coe, Hampton, and Wyatt (1950), Zdansky, Drexler and Hampel (1953) and others, although Harry Weber expressed a less optimistic view); the addition of other preparations to the contrast enema, such as exakton, clysodrast, and clysodrast novum, with an effect similar to tannic acid; and, finally, the use of veripaque, which does not include tannic acid, by MacLaren, King, and Copland (1955).

The author has tried several of these methods and for years has used tannic acid or some of the preparations with a similar effect. For the last 5 years, in addition, he has used the double contrast method extensively and believes that this technique represents an advance in the right direction.

The double contrast method for examination of the colon was introduced as early as 1923 by Fischer, a German investigator. Kirklin, of the Mayo Clinic, in 1928 visited Fischer and on returning home relayed his favorable impressions of the method to his associate, Harry Weber, who after 2 years of constant improvement established the American version of the double contrast examination of the colon in 1930. For some reason, however, the method failed to find general acceptance and opinions on its value varied widely, although it was admitted by most investigators that it has brought about definite improvement in the roentgen visualization of small tumors of the colon.

In using double contrast examination in a large number of cases the author found that four conditions must be satisfied if the examination is to prove uniformly successful: (1) the intestine must be thoroughly cleansed before the examination, (2) the intestinal mucosa must be prepared in such a way as to permit the adhesion of an extremely thin and even contrast coating on the intestinal wall, (3) the section of the radiologic department provided for this study must be built with ample toilet facilities to enable regulation of the examination and bowel evacuation, and (4) the entire examination should be completed within 20 to 25 minutes.

The step-by-step procedures involved in meeting these four conditions are described in detail and a diagram of the layout of the section of the department reserved for this study is included in the original article. For cleansing clysodrast novum is added to the preparatory enema, which is usually given in the radiologic department, and also to the two contrast enemas. The first of these enemas is composed of a thick barium medium of 6.5 specific gravity and is introduced as high as the splenic flexure. The second is given after evacuation of the first. It also consists of a thick barium medium which is introduced to the middle of the sigmoid and then followed by the insufflation of air into the entire colon with drainage of the barium medium. Clysodrast novum is a combination of isatin (sold in Germany under the name of exakton) and tannic acid. It strongly increases peristalsis and at the same time inhibits the secretion of mucus by precipitating the protein and acting as an astringent. The premedication consists of 15 c.c. of castor oil. A light supper is permitted the evening before and 1 mgm. of atropine is given by mouth about a half hour before the examination.

From December 1, 1953 to March 31, 1958, 7,561 patients were examined by this method and one or more polypoid tumors were demonstrated in 832, or 11 per cent. Of these, 254 were operated upon and adenomas were found in 242, whereas the remaining 12 had fibromas and lipomas. In the adenoma group, microscopic study revealed cancer in 39, or 16.5 per cent, and precancerous changes in 69, or 28.5 per cent. In other words, cancer or precancerous changes were found in nearly half of the roentgenologically detected polypoid tumors.

The author concludes with the following important statement: "Our experience with this modification of the double contrast method is such that we could hardly imagine going back to the conventional barium enema or contenting ourselves with the ordinary mucosal relief technique." —*T. Leucutia, M.D.*

A Safe Contrast Medium for Urethrography. IAN M. THOMPSON. *Am. J. Roentg.*, 1958, 80: 627.

THE AUTHOR points out the past frustrations in attempting to obtain satisfactory urethrographic films because of the unavailability of efficacious and safe contrast media. The introduction of oily substances, and even of a mixture of water-soluble lubricating jelly and a contrast material, into the urethra has resulted in inadequate visualization of the structures because of lack of uniform dispersion of the medium or poor viscosity and adherence of the vehicle. On the other hand, there was significant mortality from the use of oily media under pressure in the urethra incidental to oil embolism, as attested by the author's unfortunate personal experience and a perusal of the medical literature.

Recently a new contrast medium, thickened sodium acetrizoate (thixokon), became available and the author has successfully used this new medium in approximately 200 urethrographies. He has noted no untoward systemic or local effects irrespective of the type of pathologic process present in the urethra, prostate, or bladder.

Satisfactory urethrograms were obtained routinely without skip areas in the density of the opacified column. In children, in whom only instruments of small size can be used for the conventional urethrocystoscopic examination, this method proved of great value in fistulas, strictures, valves, diverticula, and other types of pathologic conditions. In the case of imperforate anus in the newborn male, thixokon urethrography was found to be ideally suited for visualization of even the minutest urethrorectal fistulas. Likewise, in the evaluation of severe or multiple urethral strictures, in the presence of which

urethroscopy frequently cannot be achieved because of the diminutive size of the urethra at the site of the stricture, thixokon urethrography was of great assistance in demonstrating the site and extent of the lesion and planning the type of plastic reconstruction needed. No ill effects whatsoever were observed in such instances, although at times there was definite roentgenographic evidence of extravasation, local or into the vascular bed.

Other lesions in which thixokon urethrography was found useful, were: obstructive disorders of the posterior urethra, ranging from contracture of the vesical neck in children to prostatic enlargement in elderly men; neurogenic bladders when functional investigation of the vesical neck and external urethral sphincteric areas was required; urethral diverticula. It was also useful in the detection of ectopic urethral orifices and/or paraurethral sinuses and ducts in the female and in the investigation of intersex problems, especially in cases of hypospadias.

To improve the visualization obtained with thixokon urethrography, the author recommends that in lesions proximal to the external urethral sphincter, the bladder be first filled with a 2.5 per cent solution of sodium iodide. In this manner a double contrast is obtained at the vesical neck and in the posterior urethra because of the greater opacity of the thixokon and the lesser opacity of the diluted sodium iodide. The placing of a finger in the rectum or deep perineum for urethral compression during the injection of the contrast substance may also be helpful in achieving a better filling of such structures as diverticula and fistulas.

In concluding, the author expresses the opinion that the efficacy and safety of the method will result in a more widespread use of urethrography as a whole.

—*T. Leucutia, M.D.*

A Classification of the Urographic Patterns in Children with Congenital Bladder Neck Obstruction. AURELIO C. USON, DONALD W. JOHNSON, JOHN K. LATTIMER, and MEYER M. MELICOW. *Am. J. Roentg.*, 1958, 80: 590.

THE AUTHORS have described their analysis in a follow-up study of available roentgenograms, including cystograms, intravenous pyelograms, and retrograde pyelograms, of 158 children ranging in age from one day to 14 years, seen at the Pediatric Urological Service of the Squier Clinic and the Babies Hospital of the Columbia-Presbyterian Medical Center, between January, 1938 and December, 1957. Twenty-five of the patients were excluded because cystographic studies were not done, but the remaining 133 patients, on the basis of the formulation, form a urographic classification of changes in the urinary tract caused by congenital obstruction at the bladder neck.

The two primary groups are divided into those with and those without vesicoureteral reflux. In addition, each group is further subdivided into three types according to the status of the upper urinary tract. Group I was made up of patients in whom no vesicoureteral reflux was demonstrated by cystography; type A (13) included those patients in whom the upper urinary tracts were normal as revealed by the intravenous and retrograde pyelographic studies, type B (8) included those in whom there was unilateral hydroureteral nephrosis of variable degree, and type C (23) included those in whom there was bilateral hydroureteral nephrosis.

Group 2 was made up of patients in whom there was vesicoureteral reflux noted on cystography, type A (11) included those in whom there was unilateral vesicoureteral reflux with variable degrees of hydroureteral nephrosis, type B (20) included those in whom there was dilatation of both upper urinary tracts, and type C (58), those of the largest single category, in whom there was bilateral vesicoureteral reflux with bilateral hydronephrosis.

The value of the delayed and post-voiding roentgenograms as a part of the routine roentgen study of the urinary tract is stressed.

The classification as presented by the authors may be of value in diminishing the amount of radiation delivered in this vulnerable group of patients.

—*Moris Horwitz, M.D.*

Arteriography of the Lower Extremities in Patients with Chronic Poliomyelitis (Die Arteriographie der Extremitaeten bei der Folgen der Heine-Medinschen Krankheit). T. BRAIBANTI. *Fortsch. Roentgenstrahl.*, 1958, 89: 277.

THE EXTREMITIES of 18 patients with chronic poliomyelitis were injected with a 75 per cent triiodide solution. The injections were performed with a short, blunt needle into the femoral arteries. A series of roentgenograms were taken of the entire extremity, shortly after the injection. The roentgenograms revealed the presence of arteriovenous anastomoses throughout the vascular bed which were numerous as compared with the normal extremities. In fact, the number of the anastomoses appeared to be related to the duration and extent of the paralysis. In mild cases the anastomoses were present only around the joints; in severe involvement they were seen throughout the entire extremity.

The author suggests that a reduction of the capillary bed in the paralyzed muscles, and an altered bloodstream resistance might be responsible for the anastomoses. When the extremities were warmed after the injections, no increase in the peripheral circulation was noted and the number of anastomoses remained the same. Prolonged immobilization of the extremities in a brace or cast apparently favored the development of anastomoses.

Six roentgenograms demonstrating the injected limbs are included in the article.

—*George B. Wichman, M.D.*

MISCELLANEOUS

Considerations of the Methods Used and the Immediate Clinical Results of Telecobalt therapy (Considerazioni sulla metodica e sui resultati clinici immediati della telecobaltoterapia). ENRICO BENASSI, and CESARE SINISTRERO. *Ann. ostet. gin.*, 1958, 79: 879.

THE AUTHORS have been working with this medium for more than 18 months at their center for the treatment of tumors with cobalt irradiation. The position and, in so far as possible, the volume of the area to be radiated is determined by roentgenograms in various

projections, and the depth of the lesion has been marked by lead surface markings and special rodlike markers by means of stratigraphy. The data have been transferred to a sketch and the amount of irradiation administered mathematically computed by an associate, a physicist.

The patients treated by telecobalt therapy included more than 50 with inoperable tumors of the lungs and the mediastinum, 35 tumors of the bladder, tumors of the brain, of the uterus, of the ovary, of the breast, of the stomach and intestines, of the pancreas, of the nose, paranasal sinuses, oral cavity, pharynx and larynx and of sarcomas of the bone and of the soft parts and of skeletal metastases.

The original article includes roentgenograms of the chest and bladder tumors and of the bone metastases. Roentgenograms made before and after treatment showed disappearance or notable decrease of the tumor shadows.

Their experience led the authors to consider the method of telecobalt therapy a valuable aid in the struggle against tumors, especially those of malignant nature and in advanced stages when other techniques have not been effective. Under such conditions, the method offers important palliative possibilities.

—John W. Brennan, M.D.

The Skin and the Gamma (Y) Rays of Cobalt^{60} (La peau et les rayons Y du cobalt 60). P. Czerniak. *Ann. ostet. gin.*, 1958, 79: 923.

Cobalt^{60} gives off gamma rays of rather uniform energy, one of 1.17 and another of 1.332 megavolts (mev.). Radium emits gamma rays of 0.188 mev., 0.250 mev., 0.34 mev., 0.6 mev., 1.37 mev., 1.81 mev., 2.05 mev., and even 3.060 mev.

The author conducted experiments with these two media, using 5.02 mgm. of radium and 4.12 mc. of cobalt^{60}. Films were exposed in contact with the skin of the thorax, abdomen, back of the hand and gluteal region, and at a distance of 2 and of 5 cm. from the skin. The dosages were estimated by the densitometer of Saclay. The readings for the 4 regions, in the order listed above, and for irradiations at a distance of 2 cm. from the skin, were for radium 118, 127, 125, and 123, and at a distance of 2 cm., 100; for cobalt^{60} the corresponding figures were 134, 137, 140, 135, and 100. The readings with the films at a distance of 5 cm. from the skin, for cobalt^{60} were 103, 106, 110, 100, and 100; and for radium, 104, 128, 151, 144, and 100.

The figures show that the degree of dissipation of the rays was greater for radium than for cobalt^{60}, and that cobalt^{60} exerts its ionizing effect at a greater depth beneath the skin, sparing the more sensitive skin layers nearer the surface.

Concerning the application of these principles in the treatment of skin diseases, three cases are illustrated in the original text. The first concerned the radiocobalt destruction of a hemoangioma of the right cheek. Thirteen days after cessation of treatment there was visible only a slight erythema of the skin. The second patient showed a marked epidermolysis of the skin incidental to the treatment of a recurrence of a cylindroma of the right submaxillary region. Three months later the skin presented an entirely normal appearance. In the third case xeroderma pigmentosum was treated with cobalt^{60} with almost complete disappearance of the neoplasms and without the production of new growths in the immediate vicinity of the treated lesions.

The author believes that radioactive cobalt can be used to send powerful and sharply beamed irradiations with ionizing effect into the deep tissues of the skin, which are much less radiosensitive than the superficial layers; and the sharply defined border of the beam prevents the danger of under-irradiation of the marginal regions. *—John W. Brennan, M.D.*

Armadillo; A Protective Clothing as a Shield from X-radiation. J. M. Tanner, R. H. Whitehouse, and J. H. Powell. *Lancet*, 1958, 2: 779.

During the past few years increased attention has been paid to the protection of the body, and especially of the gonads, during ordinary roentgenologic examinations and many shielding devices have been proposed.

The authors designed and had manufactured a new material which they called "armadillo." This material consists of a series of lead scales each sealed in a flexible plastic envelope and imbricated so as to overlap its neighbors, both above and below and from side to side, as in Roman armor. The material is quite flexible, is 30 per cent lighter than lead rubber of equivalent protective power, and can be shaped into any garment fitting the body contours. Moreover, it can be cleaned and sterilized by means of autoclaving.

Three items have been devised for general use: a jockstrap, weighing 8 ounces, to be worn for the protection of the testicles; a short apron, weighing 20 ounces, for shielding of the ovaries; and a full-length apron which can be draped over the operator's knees. In addition, pads of the material are manufactured in sizes of 12 by 12 and 12 by 30 inches, with eyelets at the corners through which weights may be hung, for the immobilization and protection of an infant undergoing roentgenologic examination. The possibility of making a garment for protection of the hands is also being investigated. *—T. Leucutia, M.D.*

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Nature and Treatment of Septic Shock. WILLIAM A. ALTEMEIER and WILLIAM R. COLE. *Arch. Surg.*, 1958, 77: 498.

SHOCK associated with sepsis has been recognized for many years. Relatively little is known concerning the pathologic physiology of shock associated with infection. The review of the published work indicates that at least four factors may be concerned with its development.

1. A loss of fluid from the circulation, resulting from dehydration, persistent vomiting, continued diarrhea, or massive exudation into body cavities, may produce hemoconcentration and a diminished blood volume.

2. A disparity may develop between the circulating blood volume and the capacity of the peripheral vascular bed, caused by vasodilatation in the presence of a normal, or nearly normal, blood volume.

3. Failure of the peripheral circulation may be caused by the direct action of bacteria or their toxins on the capillary walls, by the effect of histaminelike substances on the vascular tree, or by the direct action of bacterial toxins on the heart.

4. The adrenal glands may be involved either indirectly by toxemia or directly by the infection.

The characteristic signs and systems noted in the review by the authors included the following:

1. The sudden, insidious, and unanticipated development of hypotension, tachycardia, cyanosis, urinary suppression, and other symptoms of severe circulatory collapse in a patient with fever.

2. The occurrence of a shocklike state in the absence of the usual causes, such as hemorrhage or trauma.

3. The presence of a serious infection which may be obvious or obscured by the masking of localized symptoms because of antibiotic therapy.

4. The sudden development of the signs of shock in a patient with a known intra-abdominal abscess.

5. The failure of the state of shock to respond to the usual methods of treatment used for hemorrhagic or traumatic shock.

6. The presence of a high white blood cell count, usually 20,000 or more, with a marked predominance of polymorphonuclear cells and evidence of toxic granulation. A very low white blood cell count may also be suggestive of an overwhelming infection.

7. The presence of petechiae, unexplained delirium, or ileus.

A plan of treatment for patients with septic shock was evolved from the observations made in a previous study of 93 fatal cases. This consisted of various supportive measures to sustain life and maintain urinary function until massive and effective antibiotic therapy could overcome the overwhelming infection. Surgical drainage or excision of the source of infection was done at a time when it was considered indicated and feasible. Emphasis was placed on the restricted infusion of blood and plasma, the administration of arterenol, the use of hydrocortisone when arterenol was inadequate, the administration of oxygen, and the intravenous injection of massive doses of the indicated antibiotic agents. In 41 cases seen during the past 2 years, it has been possible to save 16 patients by this treatment. The method used and the results obtained are described and illustrated with representative charts to depict the patients' course and the complications noted. The authors conclude by stating that the results obtained are encouraging, but more knowledge and experience are needed for the successful management of this highly fatal condition.

—Gordon Madding, M.D.

Studies on the Absorption of Escherichia Coli Endotoxin from the Gastrointestinal Tract of Dogs in the Pathogenesis of "Irreversible" Hemorrhagic Shock. JAY P. SANFORD and HOWARD E. NOYES. *J. Clin. Invest.*, 1958, 37: 1425.

SHOCK RESULTING FROM HEMORRHAGE which is not reversed by retransfusion, is observed both in man and in experimental animals. The pathogenesis of this phase of hemorrhagic shock has been the object of extensive investigation. Endogenous toxic factors liberated in response to prolonged hypoxia have been implicated. More recently, the importance of various bacterial toxins liberated during the course of hemorrhagic shock has been emphasized and it has been postulated that the irreversibility of vascular collapse is principally the consequence of the deleterious action of these substances. There are several lines of evidence to support this thesis.

Studies presented by the authors were designed to assess the absorption of the radioactive bovine type of endotoxin from various portions of the gastrointestinal tract of dogs subjected to "irreversible" hemorrhagic shock, and to evaluate possible increases in the susceptibility of dogs which have been subjected to hemorrhage to small amounts of endotoxin. The endotoxin was prepared from a strain of Escherichia coli and labeled with Cr^{51} Cl_3.

The technique was sensitive enough to detect approximately 0.001 of the LD dose of the endotoxin for normal dogs. The whole absorption of Cr^{51} labeled endotoxin from various portions of the bowel was observed in normal dogs or dogs subjected to "irreversible" hemorrhagic shock. Increased susceptibility of the dogs subjected to "reversible" hemorrhage and then injected with a 0.001 LD dose of endotoxin was not demonstrated. If an increase in susceptibility did occur, it was in the range of 100-fold, which was less than the minimal amount of endotoxin detectable. *—Gordon Madding, M.D.*

Nevi: Clinical and Pathologic Evaluation. WALTER R. NICKEN. *Plastic & Reconstr. Surg.*, 1958, 22: 109.

THE AUTHOR'S discussion is relative to the clinical and pathologic confusion which exists regarding pig-

mented lesions of the skin. A list of many of the descriptive terms relative to these lesions is given and a definition of each presented. The author enumerates the clinical symptoms or signs in nevi which indicate the existence of potentially dangerous lesions.

Suspicious changes:

1. Increase in pigmentation
2. Change in character of a mole (verrucous)
3. Color change suggesting pyogenic granuloma
4. Pigment appearing suddenly in adults
5. Local subjective awareness (itching)

Changes presuming malignancy:

1. Nodular elevation in a flat mole
2. Crusting and oozing (exudation)
3. Bleeding (spontaneous?)
4. Satellite pigmentation
5. Accelerated growth in a mole
6. Erythematous halo around a nevus
7. Ulceration

The status of biopsy of pigmented lesions is reviewed and a plea is made for microscopic examination of all lesions in the expectation of discovering existing cases of malignant melanoma. —*Gordon Madding, M.D.*

Development and Status of Clinical and Experimental Research in Lymphogranulomatosis (Hodgkin's Disease); A Critical Review (Entwicklung und Stand der Erforschung der Lymphogranulomatose, Hodgkinsche Krankheit, in Klinik und Experiment—eine kritische Uebersicht). G. P. WILDNER. *Arch. Geschwulstforsch.*, 1958, 13: 1.

IT IS IMPOSSIBLE at present to establish whether lymphogranulomatosis is to be considered as a genuine malignant tumor or as a specific infectious disease. More than 50 names have been suggested for this disease. The enormous literature presents many contradictory findings concerning possible organisms involved with the suggestion that the disease may rather represent a peculiar type of reaction to various noxae. Frequent involvement of blood relatives suggests an inherited disposition. The lack of proved diaplacental transmission would seem to support the neoplastic origin of lymphogranulomatosis. Many investigators consider it to be a virus disease, but the neoplastic theory of its origin is gaining ground. In favor of this theory are the tumorlike swellings of the lymph nodes and the inevitably fatal outcome in untreated patients, as well as the infiltrative and destructive growth and metastases via the lymphatics and blood stream. The presence of polymorphous leucocytes, eosinophiles, itching, and allergic symptoms may be attributed to a reaction against heterologous tumor protein. A pathologic protein has been demonstrated in the blood. Lymphogranulomatosis also has the specific substrate of a tumor in its atypical cells. Blastomatous transformation of a lymphogranulomatous infectious granuloma is admitted, as well as transitions to other malignant tumors of the lymph nodes. The age and sex incidence suggest malignancy. Only radical tumor therapy has proved effective, with a tendency to recurrence following inadequate therapy. Since no specific organism responsible for infection has been isolated, causal therapy for assumed infection would be impossible whereas on the assumption of a neoplastic origin, early diagnosis and prompt radical treatment offers the patient a chance of recovery.

The classification of lymphogranulomatosis according to the stage of extension before beginning treatment has shown that in stages of limited localization 5 and 10 year survivals have been reported. The conception of lymphogranulomatosis as an incurable disease should be revised and attention centered more especially upon its early recognition and correct treatment. —*Edith Schanche Moore*

Distribution of Skin Tumors of the Sole of the Foot. M. LEVENE. *Brit. M. J.*, 1958, 2: 1519.

IN AN ATTEMPT to discover whether pressure contributed to the dissemination of malignant melanoma of the foot, and especially of the sole, the author surveyed 511 lesions of the foot seen at the Christie Hospital (Manchester, England) over a 13 year period ending in 1955. Many of the cases had been recorded on diagrams or photographs. All available histologic specimens were re-examined. It was noteworthy that no basal type of tumor was found on the sole. A total of 22 squamous cell carcinomas was found in the series, of which 4 were on the dorsum and 18 on the sole. A total of 42 melanomas was found, of which 14 were found on the dorsum and 28 on the sole.

The lesions fell mainly into five categories: (1) squamous cell carcinomas; (2) melanomas; (3) malignant changes occurring upon pre-existing conditions such as burns, irradiated psoriasis, tabes dorsalis; (4) plantar warts and hyperkeratotic lesions, and (5) angiomas. The authors made diagrams of each lesion and when these site diagrams were superimposed as a single diagram an unexpected and striking distribution on the sole emerged. It was discovered that almost all of the melanomas fell in the arch region in contrast to the squamous cell carcinomas and hyperkeratotic lesions which were on the metatarsal and heel sites. Tumors arising in areas of pre-existing disease were scattered indiscriminately. Unlike all the other lesions, the angiomas could mold themselves over wide surfaces, extending frequently from the dorsum to the sole, or vice versa. The author explains this plasticity by the vascular nature of the lesions, and notes it as a feature of the angioma that might be more emphasized in its clinical diagnosis.

It was noted that squamous cell carcinomas occurred more often in the male and that melanomas seemed to be more prevalent in women. The incidence of angiomas was greater in female infants in the first year of life. The age range of patients was wider in the melanoma group than in the squamous cell carcinoma group and was not so heavily weighted toward the older patients.

The observation that the melanomas tend to occur in the arch site where there is little weightbearing suggests that much will have to be learned before accepting pressure or irritation as the means of spread, at least in early stages. —*Wayne F. Cameron, M.D.*

Tumor Cells in the Blood of Cadavers (Geschwulstzellen im Leichenblut). ILSE PECKHOLZ and WOLFGANG BÖEHM. *Deut. med. Wschr.*, 1958, 83: 1486.

THE AUTHORS, of the Pathological Institute of the University of Leipzig, Germany, examined the blood

in a series of 74 autopsies of patients who had died of malignant tumors. The blood was taken from the left and the right ventricle of the heart separately. The clotted blood was fixated in formalin, embedded in paraffin, and the sections were stained with hematoxylin-eosin and van Gieson stain.

In 10 of the 74 cases carcinoma cells were found in the blood from the heart in groups of less than 10 up to more than 50. In all instances the cells were identical with those of the original tumor. In 6 of the 10 positive cases the primary tumor was located in the bronchi or the lung. —*Werner M. Solmitz, M.D.*

DUCTLESS GLANDS

The Treatment of Toxic Nodular Goiter with Radioactive Iodine. EDWARD BIGG and JAMES R. MERKEL. *O. Bull. Northwest. Univ. M. School*, 1958, 32: 212.

THE DIAGNOSTIC AND THERAPEUTIC USE of radioactive iodine in the management of thyrotoxicosis has been one of the most significant medical advances in recent years. Since its introduction, I^{131} therapy is now widely used.

It has been thought that younger individuals exposed to small doses of beta radiation, in later years may develop thyroid malignancy; however, no such reports have appeared in the literature, and in as much as the radiation has a penetrating quality of only 2 to 3 mm., damage to the surrounding tissues is minimized. The authors avoid any discussion relative to the merits of radiation versus surgical removal of adenomas from the standpoint of overlooking malignant conditions.

They report on a series of 20 unselected patients with toxic nodular goiter treated with I^{131}, the total dosage varying from 4 to 23.5 mc. The number of dosages necessary to complete therapy varied from 1 to 5, and medication was spaced at intervals of 4 to 6 weeks.

In all of the 20 cases, thyrotoxicosis was relieved, and in all cases there was reduction in the size of the gland. In more than half of the cases, there was significant reduction so that the gland was either no longer palpable, or was no longer considered to be enlarged. One patient developed myxedema following a single dose of I^{131}.

The authors concluded that there can be no question that radioactive iodine is the treatment of choice in thyroid adenoma for patients presenting a poor operative risk or postoperative recurrence. They feel, however, that careful consideration should be given to its more widespread use in nodular goiters, since in their experience, certain previously expressed objections in regard to its limitations are not completely valid. —*Gordon Madding, M.D.*

Rauwolfia Serpentina as an Adjunct in the Preoperative Management of Toxic Goiter. CLEMENTE R. CALMA and JUVENAL C. TRINIDAD. *Philippine J. Surg. Obst. Gyn.*, 1958, 13: 369.

THE BENEFICIAL EFFECTS of reserpine with regard to its bradycardic and sedative action suggested its possible application in the preoperative treatment of thyrotoxic patients. The drug was given daily from the first day of preoperative preparation to the day of operation in addition to the usual antithyroid regimen, in both the diffuse and nodular types of toxic goiter. The preparation used was "serpasil" in the dosage of 0.25 mgm. two or three times daily depending on the severity of symptoms. In addition, for diffuse toxic goiter, tapazole, 5 mgm. three times daily, was given up to the day of operation. Lugol's solution, 5 to 10 drops daily, was given in addition to the tapazole starting 12 to 14 days before operation. For nodular or adenomatous toxic goiter tapazole was given in the same dosage as in the diffuse type except that when Lugol's solution was started 12 to 14 days before surgery tapazole was discontinued.

The side effects attributable to reserpine were nasal congestion, mild postural hypotension, headache, and, rarely, slight body weakness. These effects were only noted on a few occasions and usually occurred individually.

The author's results in 37 cases indicate that remission of symptoms is hastened and the duration of preoperative preparation shortened when reserpine is used in addition to the heretofore conventional antithyroid regimen. Reserpine is recommended only as an adjunct to the currently known antithyroid medication in the preparation of patients for definitive surgery. —*Gordon Madding, M.D.*

EXPERIMENTAL SURGERY

Experimental Study on the Surgical Treatment for Coronary Insufficiency. HIROSHI NAKANO. *Arch. jap. Chir.*, 1958, 27: 1103.

THE PURPOSE of this study was to investigate the operations designed for myocardial revascularization in order to determine which one is the most beneficial. Healthy mongrel dogs weighing about 10 kgm. were divided into the following six groups: (1) no surgery, (2) pericardiotomy, (3) cardiopericardiopexy, (4) cardiopneumonopexy without talc powder, (5) cardiopneumonopexy with talc powder, and (6) the Beck I operation. All operations were performed with sterile technique by the same team, using sodium pentobarbital anesthesia and positive pressure breathing with 100 per cent oxygen through an endotracheal tube. Thoracotomy was done through the left fourth interspace immediately after induction of anesthesia. After operation, the chest wall was firmly closed with a two layer suture and no drainage was practiced. All animals received antibiotics postoperatively. Three months later the animals were subjected to ligation of the circumflex branch of the left coronary artery. In order to analyze the possible benefits derived from each surgical procedure, electrocardiographic changes were followed up at suitable intervals for a 15 minute period after the ligation. Mortality studies and measurements of the infarct were also done.

On the basis of the experimental results it is concluded that the Beck I operation is the most beneficial and that there are no significant differences between the other procedures. In order to create a more realistic type of coronary insufficiency, the author devised a new method of producing gradual constriction of both main branches of the left coronary artery. The comparative study with this method

also revealed the same results. Even such a simple procedure as pericardiotomy protects the heart almost as well after a major coronary artery is occluded as do the other procedures, such as cardiopericardiopexy and cardiopneumonopexy, with or without the application of talc powder. This procedure produces no extensive adhesions between the pericardium and epicardium. Usually there were only easily broken adhesions along the line of the pericardial incision. The study on acrylic resin casts of the coronary arteries revealed that pericardiotomy results in the formation of new channels between the main coronaries as well as the dilatation and proliferation of already existing intercoronary anastomoses, because of its irritating effect upon the heart.

A cardiopneumonopexy without the application of talc powder also protects the heart from the circumflex ligation, although this procedure produces hardly any adhesions between the heart and the lung or between the pericardium and the epicardium. It thus seems that most of the protection provided by these procedures is produced by means of intercoronary arterial channels. Blood being added to the heart from outside sources seems to be a less important factor. —*Robert Nabatoff, M.D.*

Changes in Vaginal Epithelium Induced by Lipoid Extracts of Hypothalamic Nuclei (Equivalenti morfologici della stimolazione diencefalica sul recettore vaginale indotti dalla frazione lipidica dei nuclei ipotalamici). LAMBERTO GIANAROLI. *Riv. ital. gin.*, 1958, 41: 255.

THERE IS more and more experimental evidence for the existence of a neuroendocrine relationship between the diencephalon and the pituitary gland. Various workers have found histologic evidence of increased endocrine activity of the thyroid, adrenals, and ovaries in various laboratory animals following the administration of lipoid extracts of hypothalamic nuclei of beef origin.

The authors undertook a study of the effects of such extracts on 40 patients in a state of spontaneous or induced menopause. All of these patients had marked clinical symptoms of menopause. Fifteen of the patients were in spontaneous menopause with a duration of from 1 to 10 years. Twenty-five of the patients had surgically induced menopause for periods ranging from 3 to 7 years. Of these 40 patients, 30 had received the usual hormonal treatments for their menopause with little or no results. The patients were given the lipoid extract of beef hypothalamic nuclei intravenously in doses of 2.5 to 5 mgm. per day in series lasting from 7 to 12 days. Each patient received 3 series of treatments, each series being separated by an interval of 3 days. Vaginal smears were examined at the onset of treatment, at the end of each series of treatments, and 2, 4, and 6 months after the last series of treatments.

The effects of the extracts on the clinical symptoms varied according to whether or not the patient had an artificial or spontaneous menopause. In the patients having had a physiologic menopause, the clinical symptoms subsided rapidly during the first series of injections. There was no correlation between the effects of the treatment and the age of the patient. Within a period of 6 months after the cessation of treatment, symptoms returned in 7 patients; however, the symptoms were less marked than they had been before the treatment was started. The response to therapy was good also in the patients with a postsurgical menopause. In this group, however, there was a certain correlation between the interval of time since the onset of menopause and a lesser response to treatment.

The vaginal smears were studied for acidophilic and karyopyknotic indexes and cell tropism in response to treatment. Examinations of the smears at regular intervals showed that the injections of lipoid extract produced rapid and marked regenerative changes in the vaginal epithelium. These changes tended to regress after a variable period of time following cessation of the treatment. However, the cellular tropism remained more active than at the initiation of treatment 2 or 3 months following its cessation. It was the author's impression that there was not always a good correlation between the improvement in clinical symptoms and the changes observed in the vaginal epithelium. The effects of these extracts can be explained by a stimulation of the adrenal cortex and other endocrine organs thereby re-establishing a certain endocrine equilibrium. It could also be explained by a specific hormonal action of the extracts of hypothalamic nuclei. —*René Menguy, M.D.*

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